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U.S. Army Environmental Center

CONTRACT NO. DAAA15-91-D-0008
TASK ORDER 005

FEASIBILITY STUDY
FOR AOC 43G AND 43J

RECORD OF DECISION
AREAS OF CONTAMINATION 43G AND 43J
DEVENS, MASSACHUSETTS

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OCTOBER 1996

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AREAS OF CONTAMINATION 43G AND 43J
DEVENS, MASSACHUSETTS

OCTOBER 1996

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RECORD OF DECISION
AREAS OF CONTAMINATION 43G AND 43J
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Section Title

DECLARATION FOR THE RECORD OF DECISION

SITE NAME AND LOCATION

Areas of Contamination (AOC) 43G and 43J
Devens, Massachusetts

STATEMENT OF PURPOSE AND BASIS

This decision document presents the U.S. Army's (Army) selected remedial action for AOC 43G and 43J at Devens, Massachusetts. It was developed in accordance with the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) of 1980 as amended, 42 USC §§ 9601 et seq. and the National Oil and Hazardous Substances Pollution Contingency Plan (NCP) as amended, 40 CFR Part 300, to the extent practicable. The Devens Base Realignment and Closure (BRAC) Environmental Coordinator; the Installation Commander; and the Director of the Waste Management Division, U.S. Environmental Protection Agency (USEPA) New England have been delegated the authority to approve this Record of Decision.

This Record of Decision is based on the Administrative Record that has been developed in accordance with Section 113(k) of CERCLA. The Administrative Record is available for public review at the Devens BRAC Environmental Office, Building P-12, Devens, Massachusetts, and at the Ayer Town Hall, Main Street, Ayer, Massachusetts. The Administrative Record Index (Appendix D of this Record of Decision) identifies each of the items considered during selection of the remedial action.

ASSESSMENT OF THE SITE

Actual or potential releases of hazardous substances from AOCs 43G and 43J, if not addressed by implementing the response action selected in this Record of Decision, may present an imminent and substantial endangerment to the public health, welfare, or the environment.

DESCRIPTION OF THE SELECTED REMEDY

This remedial action addresses long-term commercial/industrial exposure to contaminated groundwater, the principal known threat at both AOC 43G and 43J. The selected remedial alternative for both AOC 43G and 43J relies on intrinsic bioremediation, groundwater and contaminant modeling, and long-term groundwater monitoring to evaluate the effectiveness of the alternative at controlling groundwater contamination and site risk. The remedy will mitigate existing groundwater contamination through natural attenuation and bioremediation and reduce the potential risk of future commercial/industrial exposure to contaminated groundwater. The major components of the selected remedy for both AOC 43G and 43J include:

- intrinsic bioremediation
- intrinsic bioremediation assessment data collection and groundwater modeling
- installing additional groundwater monitoring wells
- long-term groundwater monitoring
- annual data reports to USEPA and Massachusetts Department of Environmental Protection (MADEP)
- five-year site reviews

If the intrinsic bioremediation assessment results at AOC 43G and 43J indicate that: 1) the groundwater contaminant plume may increase in size on Army property and/or, 2) the groundwater contaminant plume remains the same size, but cannot be remediated within 30 years; a soil vapor extraction (SVE) system will be installed at the existing AOC 43G source area, and an additional cleanup action will be implemented at AOC 43J. Furthermore, if at any time during this remedy there is an indication that contaminants are migrating off Army property or an area located sufficiently inside the boundary in which compliance will be determined, according to cleanup criteria stated in the Record of Decision, that at minimum will meet drinking water standards; then the Army will implement an additional remedial action which will be protective of human health and the environment.

Should the Army change the use of either AOC, additional assessment and/or possible remedial action, may be needed based upon the possibly resultant changed risk factors. In addition, if the Army transfers either AOC by lease or deed, an Environmental Baseline Survey (EBS) will be conducted, and a determination will be made by the Army and USEPA that the selected remedy remains protective of human health and the environment.

STATE CONCURRENCE

The Commonwealth of Massachusetts has concurred with the selected remedy. Appendix E of this Record of Decision contains a copy of the declaration of concurrence.

DECLARATION

The selected remedy is consistent with CERCLA, and to the extent practicable, the NCP, is protective of human health and the environment, complies with federal and Commonwealth requirements that are legally applicable or relevant and appropriate to the remedial action, and is cost effective. The remedy utilizes permanent solutions and alternative treatment technologies, to the maximum extent practicable for both AOC 43G and 43J.

The additional remedy at AOC 43G and/or 43J, if implemented, would also be consistent with CERCLA, and to the extent practicable, the NCP, be protective of human health and the environment, comply with federal and Commonwealth requirements that are legally applicable or relevant and appropriate to the remedial action, and be cost effective. The remedy utilizes permanent solutions and alternative treatment technologies, to the maximum extent practicable.

Because the selected remedy, for both AOC 43G and 43J, will result in hazardous substances remaining on-site above health-based levels, a review will be conducted within five years after commencement of the remedial action to ensure that the remedy, at each AOC, continues to provide adequate protection of human health and the environment.

DECLARATION FOR THE RECORD OF DECISION
Areas of Contamination 43G and 43J
Devens, Massachusetts

The foregoing represents the selection of a remedial action by the U.S. Department of the Army and the U. S. Environmental Protection Agency, with the concurrence of the Commonwealth of Massachusetts Department of Environmental Protection.

Concur and recommend for immediate implementation:

U.S. DEPARTMENT OF THE ARMY

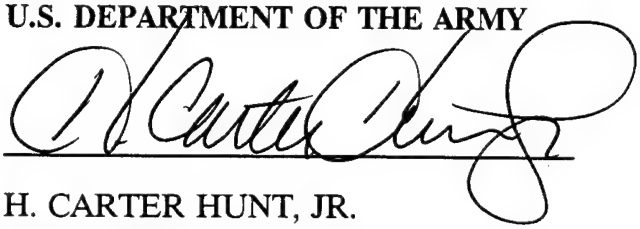
James C Chambers — 16 Oct 96

JAMES C. CHAMBERS — Date
BRAC Environmental Coordinator
Devens Reserve Forces Training Area

The foregoing represents the selection of a remedial action by the U.S. Department of the Army and the U. S. Environmental Protection Agency, with the concurrence of the Commonwealth of Massachusetts Department of Environmental Protection.

Concur and recommend for immediate implementation:

U.S. DEPARTMENT OF THE ARMY



16 OCT 1996

H. CARTER HUNT, JR.
Commander
Devens Reserve Forces Training Area

Date

The foregoing represents the selection of a remedial action by the U.S. Department of the Army and the U. S. Environmental Protection Agency, with the concurrence of the Commonwealth of Massachusetts Department of Environmental Protection.

Concur and recommend for immediate implementation:

U.S. ENVIRONMENTAL PROTECTION AGENCY

Linda M. Murphy

Oct. 17, 1995

LINDA M. MURPHY
Director, Office of Site Remediation and Restoration
U.S. Environmental Protection Agency, New England

Date

DECISION SUMMARY

I. SITE NAME, LOCATION, AND DESCRIPTION

Fort Devens is a Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) National Priorities List (NPL) site located in the Towns of Ayer and Shirley (Middlesex County) and Harvard and Lancaster (Worcester County), approximately 35 miles northwest of Boston, Massachusetts. Prior to closure, the installation occupied approximately 9,600 acres and was divided into the North Post, Main Post, and South Post (Figure 1 in Appendix A).

This Record of Decision addresses subsurface soil and groundwater contamination at Area of Contamination (AOC) 43G, and groundwater contamination at AOC 43J. Both AOCs are located within the newly created Devens Reserve Forces Training Area. AOC 43G is located on Queenstown Road in the central portion of the Main Post Reserve Forces Training Area. AOC 43J is located on Patton Road at the southern edge of the Main Post Reserve Forces Training Area (see Figure 1 in Appendix A).

II. SITE HISTORY AND ENFORCEMENT ACTIVITIES

A. Land Use and Response History

Fort Devens was established in 1917 as Camp Devens, a temporary training camp for soldiers from the New England area. In 1931, the camp became a permanent installation and was redesignated as Fort Devens. Throughout its history, Fort Devens served as a training and induction center for military personnel, and as a unit mobilization and demobilization site. All or portions of this function occurred during World Wars I and II, the Korean and Vietnam conflicts, and Operations Desert Shield and Desert Storm. During World War II, more than 614,000 inductees were processed and Fort Devens reached a peak population of 65,000.

The primary mission of Fort Devens was to command, train, and provide logistical support for non-divisional troop units and to support and execute Base Realignment and Closure (BRAC) activities. The installation presently supports the Army Readiness Region and National Guard units in the New England area.

Fort Devens was selected for cessation of operations and closure under the Defense BRAC Act of 1990 (Public Law 101-510). The installation was officially closed in 1996 and was renamed Devens, Massachusetts.

A more complete description of AOC 43G and 43J can be found in the individual Remedial Investigation (RI) reports, February 1996, Section 5, and the Feasibility Study (FS) report, June 1996, Subsection 1.2.

B. Enforcement History

In conjunction with the Army's Installation Restoration Program (IRP), Fort Devens and the U.S. Army Environmental Center (USAEC; formerly the U.S. Army Toxic and Hazardous Materials Agency [USATHAMA]) initiated a Master Environmental Plan (MEP) in 1988. The MEP assessed the environmental status of study areas (SAs), discussed necessary investigations, and recommended potential responses to environmental contamination. Priorities for environmental restoration at Fort Devens were also assigned. The MEP identified 18 historic gas station sites (SA 43B through 43S) and the then active petroleum, oils, and lubricant (POL) storage area (SA 43A), as some of the potential sources of groundwater contamination and recommended that each SA be investigated to determine the distribution of contamination.

On December 21, 1989, Fort Devens was placed on the NPL under CERCLA as amended by the Superfund Amendments and Reauthorization Act (SARA). A Federal Facilities Agreement (Interagency Agreement [IAG]) was developed and signed by the Army and USEPA Region I on May 13, 1991, and finalized on November 15, 1991. The IAG provides the framework for the implementation of the CERCLA/SARA process at Fort Devens.

In 1991, the U.S. Department of Defense, through USAEC, initiated site investigations (SIs) at the historic gas station SAs at Fort Devens. The SI Data Package was issued in January 1993 and the Final SI report was issued in May 1993, summarizing the data collected during the SI phase at each of the historic gas station SAs. A preliminary risk evaluation (PRE), which compared concentrations of detected contaminants to USEPA and MADEP risk-based standards, was also completed for each historic gas station in the Final SI Report. Based on the collected data and the findings of the PRE, additional investigations were recommended for a subset of the historic gas station (SA 43B, 43D,

43G, 43H, 43I, 43J, and 43O). The remaining SAs were recommended for no further action (NFA) or a removal action.

In 1993, a supplemental SI (SSI) was conducted, at the above mentioned subset of SAs, to further define the contamination detected during the SI. The SSI Data Package was issued in January 1994, and the Revised Final SI report was issued in October 1995. Both documents presented the additional data collected during the SSI, an updated PRE, and recommendations for additional activities. Based on the findings of the SSI and the updated PRE, two sites (SA 43G and 43J) were transferred to the RI/FS phase, and the remaining SAs were recommended for NFA or a removal action. The site designations for SA 43G and 43J were administratively changed to AOC, at this junction.

The purpose of the RI was to determine the nature and distribution of contamination at the AOCs, assess the risk to human health, and provide a basis for conducting an FS. The RI at each AOC was completed in 1994 and the Final RI report for both AOCs was issued in February 1996.

FS reports that evaluated remedial action alternatives for cleanup of groundwater at AOC 43G and 43J were issued in June 1996. The separate FS reports identified and screened four remedial alternatives at AOC 43G and five remedial alternatives at AOC 43J. Each FS also provided a detailed analysis of each of these remedial alternatives to allow decision-makers to select a remedy for cleanup of groundwater at both AOCs.

The proposed plan detailing the Army's preferred remedial alternative was issued in August 1996 for public comment. Technical comments presented during the public comment period are included in the Administrative Record. Appendix C, the Responsiveness Summary, contains a summary of these comments and the Army's responses, and describes how these comments affected the remedy selection.

III. COMMUNITY PARTICIPATION

The Army has held regular and frequent informational meetings, issued a proposed plan and press releases, and held a public meeting to keep the community and other interested parties informed of activities at AOC 43G and 43J.

In February 1992, the Army released, following public review, a community relations plan that outlined a program to address community concerns and keep citizens informed about and involved in remedial activities at Devens. As part of this plan, the Army established a Technical Review Committee (TRC) in early 1992. The TRC, as required by SARA Section 211 and Army Regulation 200-1, included representatives from USEPA, USAEC, Devens, MADEP, local officials, and the community. Until January 1994, when it was replaced by the Restoration Advisory Board (RAB), the committee generally met quarterly to review and provide technical comments on schedules, work plans, work products, and proposed activities for the SAs/AOCs at Devens. The SI, RI, and FS reports, proposed plan, and other related support documents were all submitted to the TRC or RAB for their review and comment.

The Army, as part of its commitment to involve the affected communities, forms a RAB when an installation closure involves transfer of property to the community. The Devens RAB was formed in February 1994. The RAB consists of 28 members (15 original TRC members plus 13 new members) who are representatives from the Army, USEPA Region I, MADEP, local governments and citizens of the local communities. It meets monthly and provides advice to the installation and regulatory agencies on Devens cleanup programs. Specific responsibilities include: addressing cleanup issues such as land use and cleanup goals; reviewing plans and documents; identifying proposed requirements and priorities; and conducting regular meetings that are open to the public.

On August 25, 1996, the Army issued the proposed plan to citizens and organizations, to provide the public with a brief explanation of the Army's preferred remedy for cleanup at both AOC 43G and 43J. The proposed plan also described the opportunities for public participation and provided details on the upcoming public comment period and public meetings.

A public notice announcing the public meeting was published the week of September 2, 1996 in the Times Free Press/Public Spirit, the Lowell Sun, Fitchburg-Leominster Centennial and Enterprise, and the Worcester Telegram. The Army also made the proposed plan available to the public at the information repositories at the town libraries in Ayer, Shirley, Lancaster, and Harvard, and at the Devens BRAC Environmental Office.

From August 25 to September 26, 1996, the Army held a 30-day public comment period to accept public comments on the alternatives presented in the FS and the proposed plan

and on other documents released to the public. On September 5, 1996, the Army held a public meeting at Devens to present the Army's proposed plan to the public to accept verbal or written comments from the public, and discuss the cleanup alternatives evaluated in the FS. This meeting also provided the opportunity for open discussion concerning the proposed cleanup. A transcript of this meeting, public comments, and the Army's response to comments are included in the attached Responsiveness Summary (Appendix C).

All supporting documentation for the decision regarding AOC 43G and 43J is contained in the Administrative Record for review. The Administrative Record is a collection of all the documents considered by the Army in choosing the remedy for both AOC 43G and 43J. On August 26, 1996, the Army made the Administrative Record available for public review at the Devens BRAC Environmental Office, and at the Ayer Town Hall, Ayer, Massachusetts. An index to the Administrative Record is available at the USEPA Records Center, 90 Canal Street, Boston, Massachusetts and is provided as Appendix D.

IV. SCOPE AND ROLE OF THE RESPONSE ACTION

The Army developed the selected remedy by combining components of different source control and management of migration alternatives. The selected remedy for AOC 43G and 43J will control the migration of contaminants in groundwater, reduce contaminant concentrations, and control potential groundwater use. The selected remedy will also provide environmental monitoring of groundwater for a period of up to thirty years. The implementation of the selected alternative will not adversely affect any future response actions at AOC 43G and 43J, should they be required.

This remedial action will address the principal threat to human health at AOC 43G and 43J posed by long-term commercial/industrial worker exposure to contaminated groundwater.

V. SUMMARY OF SITE CHARACTERISTICS

A. AOC 43G

AOC 43G is located in the central portion of the Main Post on Queenstown Road (see Figure 1 in Appendix A). The AOC consists of the former Army Air Force Exchange Service (AAFES) gas station and historic gas station G (see Figure 2 in Appendix A).

Originally SA 43G consisted solely of historic gas station G, which was one of eighteen historic gas station sites. The station was used during World War II as a vehicle motor pool to support military operations. The motor pool operations were discontinued during the late 1940s or early 1950s. No records were available on the decommissioning of the motor pool and therefore, there was no evidence of the exact location of historic gas station G or that the station's underground storage tank (UST) had been removed. The reported location of historic gas station G was southwest of the former AAFES gasoline station (Building 2008) and southwest of Building 2009 (see Figure 2 in Appendix A). The structures of historic gas station G consisted of a pump island and a small gasoline pumphouse. Reportedly, the gas station had one 5,000-gallon (or possibly 5,140-gallon) UST located between the gasoline pumphouse and the pump island.

AOC 43G was expanded to include the former AAFES gas station after the SI was completed in 1993. The AAFES gas station was added to further define the distribution of contamination detected during the past gasoline UST removals (completed in 1990), as well as the contaminants detected during a waste oil UST removal completed in 1992. The waste oil UST removal was stopped prior to the removal of all contaminated soil because of concerns that Building 2008 would be undermined. A completed description of the former waste UST and gasoline UST removals are presented in the Final RI report.

The former AAFES gasoline station is located approximately 120 feet northeast of historic gas station G. During the time of the field investigations, the AAFES gas station was comprised of the service station (Building 2008) which houses three vehicle service bays and the former AAFES store, three 10,000-gallon USTs, and associated pump islands. The AOC was divided into three areas during the SSI to better focus the investigations. Area 1 was comprised of historic gas station G, Area 2 was made up of the former 10,000-gallon gasoline USTs, and Area 3 was the former waste oil UST (see Figure 2 in Appendix A).

The 10,000-gallon gasoline USTs, and associated piping, were removed by the U.S. Army Corps of Engineers - New England Division in July/August 1996. In addition, the sand and gas trap and residual soil contamination in Area 3 were removed during this removal action.

B. AOC 43J

AOC 43J is located on an access road in the central portion of the Main Post, that connects Patton Road and Queenstown Road (see Figure 1 in Appendix A). The area around the location of AOC 43J, was most recently used as a vehicle storage yard and maintenance facility (Building T-2446) for a Special Forces unit of the U.S. Army. The former maintenance facility used a UST for storage of maintenance wastes. This UST was located just south of Building T-2446. The yard and maintenance facility is paved with asphalt and surrounded by a chain-link fence with a locked gate located at the northern side of the yard (Figure 3 in Appendix A).

Prior to the building of the Special Forces unit vehicle maintenance facility, this area was historically used as a gas station/motor pool (historic gas station J) during the 1940's and 1950's. The structures of this historic gas station at AOC 43J consisted of a pump island and a small gasoline pumphouse. This gas station was reported to be a Type A station which had one 5,000-gallon (or possibly 5,140-gallon) UST located between the gasoline pumphouse and pump island. The station was used during World War II as a vehicle motor pool to support military operations. The motor pool operations were discontinued during the late 1940s or early 1950s. No records were available on the decommissioning of this motor pool or the removal of the associated UST.

During the 1992 SI, an abandoned 5,000-gallon UST was detected at historic gas station J. This UST was added to the Fort Devens UST removal program and removed during the summer of 1992. At the same time the former waste oil UST was also removed. During both UST removals, contaminated soil was removed and disposed of by Fort Devens. A completed description of these removals is presented in the Final RI report.

Section 1 of the AOC 43G and 43J FS reports, contains an overview of the RI completed at each AOC. A complete discussion of site characteristics can be found in Sections 5, 6, and 7 of the RI reports, February 1996. Significant findings of the RI are summarized in the following subsections.

1. Soils

a. AOC 43G

Analytes detected in soil samples collected during the SI, SSI, and RI at AOC 43G are consistent with the historical use of this area as a gas station. The benzene, toluene, ethylbenzene, and xylene (BTEX) and total petroleum hydrocarbon (TPHC) concentrations detected in Areas 2 and 3 indicate that residual soil contamination is still present in these areas from leaks and spills associated with the former gasoline and waste oil USTs. The results of the soil sampling in Area 2 show that residual fuel-related soil contamination appears to be present in the soil at the southeastern corner, and directly adjacent to the former gasoline USTs, from approximately 20 to 28 feet below ground surface (bgs). The results of the soil sampling at Area 3 indicate that residual soil contamination is present in the shallow soils (approximately 6 to 8 feet bgs) below the former waste oil UST and around the former sand and gas trap (see Figure 3 in Appendix A).

b. AOC 43J

Field analytical and off-site analytical laboratory data from TerraProbe[SM] and soil boring samples, collected during the SI, SSI, and RI, indicate that the former historic gas station and waste oil USTs were the sources for the existing subsurface soil contamination at AOC 43J. Primary contaminants detected in the subsurface soil samples were BTEX, 2-methylnaphthalene, naphthalene, phenanthrene, pyrene, and TPHC. These volatile organic compounds (VOCs) and semi-volatile organic compounds (SVOCs) are documented constituents of gasoline and oils. Based upon these results, it appears that leaks and spills from both former USTs have caused the existing soil contamination.

Subsurface soil contamination extends south from the former historic gas station and waste oil UST excavation approximately 180 feet, and is a maximum of 110 feet wide. Subsurface soil contamination does extend horizontally beyond the southwestern fence line, however, the remaining soil contamination appears to be within the fenced area of AOC 43J. The majority of contaminated soil was detected at, or just below, the water table, at depths ranging from 7 to 12 feet bgs. Distribution of the subsurface soil contamination supports the USTs as source areas. Subsurface soil contamination was detected at higher concentrations at the water table, with decreasing concentrations as

sample depth increased. Based on soil boring data, it appears that contamination has not migrated vertically to the bedrock surface.

2. Groundwater

a. AOC 43G

Distribution and concentrations of VOCs (primarily BTEX) and SVOCs detected in 1994/1995 groundwater samples are in agreement with pre-1994 data. The distribution of the groundwater contamination appears to confirm that the groundwater contaminant source is the apparent residual soil contamination below the former gasoline USTs in Area 2, and potentially the former residual soil contamination detected in Area 3. The intrinsic bioremediation assessment will further determine the distribution of the groundwater contamination below the former gasoline USTs, including bedrock.

The highest concentrations of BTEX and polynuclear aromatic hydrocarbons (PAHs) were detected in the monitoring wells directly downgradient of Areas 2 and 3 (AAFES-1D, AAFES-2, AAFES-6, XGM-93-02X, XGM-94-03X, and XGM-94-04X). Benzene concentrations were detected up to 2,000 μg/L in AAFES-2 in the last RI groundwater sampling round (Round 6) (see Figure 3 in Appendix A).

BTEX was detected in several downgradient (XGM-94-06X, XGM-94-08X and XGM-94-10X) and crossgradient (XGM-94-03X and XGM-94-09X) monitoring wells. Concentrations exceeded drinking water standards in XGM-94-10X, XGM-94-08X, and XGM-94-07X with the highest concentration being 7.7 μg/L at XGM-94-10X.

The RI groundwater results indicate that the highest concentrations of groundwater contamination appear to be in the groundwater at the base of the slope directly south (downgradient) of Areas 2 and 3. The groundwater contamination concentrations decrease with distance (in the downgradient and crossgradient directions) from this area.

Although concentrations of inorganic analytes generally exceed Fort Devens background concentrations in unfiltered samples, this appears to be a result of total suspended solids (TSS) in the unfiltered sample rather then dissolved site-related contamination. In addition, the distribution of detected inorganic analytes does not indicate that their presence is related to past activities at AOC 43G.

A complete presentation of the groundwater results can be found in Section 7 of the AOC 43G Final RI report.

b. AOC 43J

Distribution and concentrations of VOCs detected in 1994/1995 groundwater samples are in agreement with pre-1994 off-site laboratory data and the field analytical data. The distribution of the groundwater contamination appears to confirm that the past sources of groundwater contamination were the former historic gas station and waste oil USTs, and that the existing source of the groundwater contamination is the residual soil contamination at and directly downgradient of the former UST locations.

BTEX, chlorinated solvents, and several SVOCs were detected in several monitoring wells downgradient (2446-02, 2446-03, XJM-93-04X, XJM-94-05X, XJM-94-06X, and XJM-94-09X) of the former UST excavations (see Figure 3 in Appendix A). Benzene concentration were detected up to 300 μg/L at XJM-94-05X in the last RI groundwater sampling round (Round 6).

Groundwater contaminant distribution is similar to soil contaminant distribution, except that low concentrations of fuel-related contaminants have been spread southeastward (toward XJM-94-08X) by seasonal fluctuations in groundwater flow direction.

Although concentrations of inorganic analytes were generally above Fort Devens background concentrations in unfiltered samples, it appears that these results were caused by TSS rather than dissolved site-related contamination.

A complete presentation of the groundwater results can be found in Section 7 of the AOC 43J Final RI report.

C. Sediment

AOC 43G

One sediment sample (XGD-93-02X) was collected from the storm water collection outfall located east of AOC 43G during the SSI (see Figure 2 in Appendix A). A surface water sample was not collected from this location because there was insufficient surface water volume available at the time of sample collection.

No VOCs or SVOCs were detected in XGD-93-02X. TPHC was detected at 448 micrograms per gram (μg/g). Several inorganic analytes were detected, and the total organic carbon (TOC) concentration was 8,970 μg/g.

VI. SUMMARY OF SITE RISKS

A. AOC 43G

A human health risk assessment has been conducted to evaluate potential health risks to individuals under current or foreseeable future site conditions at AOC 43G. The risk assessment is consistent with relevant guidance and standards developed by USEPA and incorporates data from the scientific literature used in conjunction with professional judgment. A commercial/industrial worker scenario was used to assess potential human health risks associated with contaminants detected in soil, sediment and groundwater because the future reuse of this area will remain similar to its present use. Because of the urbanized nature of this site and the lack of exposure pathways (the site is paved), an ecological risk assessment was not performed. Tables 1 and 2 in Appendix B summarize the statistics used in the risk assessment. A complete presentation of the risk assessment can be found in Section 9 of the Final RI report.

The assessment for AOC 43G consists of the following components:

- Selection of Chemicals of Potential Concern (CPCs)
- Exposure Assessment
- Toxicity Assessment
- Risk Characterization
- Uncertainty Evaluation
- Summary and Conclusions

1. Subsurface Soil

Potential human health risks associated with exposure to subsurface soil at Areas 2 and 3 of AOC 43G were evaluated in the Final RI report. Potential human health risks associated with exposure to subsurface soil in Area 1 were evaluated in the Final SI report and were not presented in the RI risk assessment. The primary CPCs in soil were ethylbenzene, toluene, xylene, PAHs, and inorganics. The evaluated exposure scenario

was for a utility/maintenance worker. Estimated carcinogenic risks did not exceed the USEPA target risk range or MADEP Massachusetts Contingency Plan (MCP) risk management level. Similarly, potential noncarcinogenic risks did not exceed the USEPA and MADEP MCP target level.

2. Groundwater

Risks associated with exposure to groundwater were evaluated for unfiltered groundwater representing the source area and for unfiltered groundwater identified as downgradient. The receptor evaluated was a future commercial/industrial worker. Estimated carcinogenic risks were at the upper end or exceeded the USEPA risk range of $1x10^{-4}$ to $1x10^{-6}$ for exposure to both mean and maximum concentrations of CPCs in source area groundwater ($1x10^{-4}$ and $6x10^{-4}$, respectively). Arsenic and benzene were the primary contributors to the excess risk in both cases. At maximum concentrations both arsenic and benzene produced individual risks above $1x10^{-4}$. In downgradient groundwater, only exposure to maximum concentrations produced a cancer risk exceeding the USEPA range. Arsenic contributed 94 percent of the risk of $2x10^{-4}$ for maximum concentrations.

Risks were estimated for commercial/industrial worker exposure to filtered groundwater assuming that concentrations of organic CPCs remain the same as in unfiltered groundwater. Estimated carcinogenic risks were at the upper end or exceeded the USEPA target risk range of $1x10^{-4}$ to $1x10^{-6}$ for exposure to both mean and maximum concentrations of CPCs in source area filtered groundwater ($1x10^{-4}$ and $4x10^{-4}$, respectively). Arsenic and benzene were the primary contributors to the excess risk in both cases. At maximum concentrations both arsenic and benzene produced individual risks above $1x10^{-4}$. In downgradient filtered groundwater, exposure to both mean and maximum concentrations produced risks within the USEPA range ($5x10^{-5}$ and $9x10^{-5}$, respectively).

If the modified cancer slope factor (CSF) for arsenic was used to estimate excess lifetime cancer risks, the cancer risks associated with exposure to both average and maximum concentrations of arsenic in filtered and unfiltered groundwater would fall below $1x10^{-4}$.

Estimated noncarcinogenic risks exceeded the USEPA target level of 1 for both source area and downgradient unfiltered groundwater at mean and maximum concentrations. Hazard Indices (HIs) for the source area are 36 and 98 for exposure to mean and maximum concentrations, respectively. Benzene, manganese, iron, and arsenic are the

primary risk contributors for source area groundwater. HIs for downgradient groundwater are 11 and 21 for mean and maximum concentrations, respectively. Manganese and benzene are the primary contributors for downgradient groundwater. Individual hazard quotients (HQs) for the primary contributors in both source area and downgradient groundwater all exceed the USEPA target level of 1.

For filtered groundwater, estimated noncarcinogenic risks exceeded the USEPA target level of 1 for both source area and downgradient groundwater at mean and maximum concentrations. HIs for the source area are 36 and 98 for exposure to mean and maximum concentrations, respectively. Benzene, manganese, iron, and arsenic are the primary contributors for source area groundwater. HIs for downgradient groundwater are 11 and 21 for mean and maximum concentrations, respectively. Manganese and benzene are the primary contributors for downgradient groundwater. Individual HQs for the primary contributors in both source area and downgradient groundwater all exceed the USEPA target level of 1.

A comparison of detected concentrations of CPCs in source area and downgradient groundwater to federal and state drinking water standards and guidelines showed several exceedances. In source area groundwater, the following CPCs were detected at concentrations above a federal or state standard: xylenes, benzene, ethylbenzene, arsenic, lead, nickel, aluminum, iron, manganese, and sodium. In downgradient groundwater, detected concentrations of benzene, aluminum, iron, manganese and sodium exceed federal or state drinking water standards or guidelines.

B. AOC 43J

A human health risk assessment has been conducted to evaluate potential health risks to individuals under current or foreseeable future site conditions at AOC 43J. The risk assessment is consistent with relevant guidance and standards developed by USEPA and incorporates data from the scientific literature used in conjunction with professional judgment. Because of the urbanized nature of this site and the lack of exposure pathways, an ecological risk assessment was not conducted. Table 3 in Appendix B summarizes the statistics used in the risk assessment. A complete presentation of the risk assessment can be found in Section 9 of the Final RI report.

The assessment for AOC 43J consists of the following components:

- Selection of CPCs
- Exposure Assessment
- Toxicity Assessment
- Risk Characterization
- Uncertainty Evaluation
- Summary and Conclusions

1. Subsurface Soil

Potential health risks associated with exposure to subsurface soil at the source area and the perimeter area of AOC 43J were evaluated in the Final RI report. The primary CPCs identified in soil were ethylbenzene, toluene, xylene, noncarcinogenic PAHs, and inorganics. The exposure scenarios evaluated were for a utility/maintenance worker and a construction worker. Estimated carcinogenic risks did not exceed the USEPA risk range or MADEP MCP risk level. Similarly, potential noncarcinogenic risks did not exceed the USEPA and MADEP MCP target level.

2. Groundwater

Risks associated with exposure to unfiltered and filtered groundwater were evaluated for groundwater representing the source area and for groundwater identified as downgradient. The receptor evaluated was a future commercial/industrial worker. Estimated carcinogenic risks for unfiltered groundwater exceeded the USEPA target risk range of $1x10^{-4}$ to $1x10^{-6}$ for exposure to both mean and maximum concentrations of CPCs in source area groundwater ($3x10^{-4}$ and $6x10^{-4}$, respectively). Arsenic was the primary contributor to risk exceeding the $1x10^{-4}$ risk level. Assuming exposure to maximum concentrations, benzene and carbon tetrachloride produced individual risks above $1x10^{-5}$. In unfiltered downgradient groundwater, estimated carcinogenic risks were within the USEPA target risk range.

Risks were estimated for commercial/industrial worker exposure to filtered groundwater assuming that concentrations of organic CPCs remain the same as in unfiltered groundwater. Estimated carcinogenic risks exceeded the USEPA risk range of $1x10^{-4}$ to $1x10^{-6}$ for exposure to both mean and maximum concentrations of CPCs in source area groundwater ($2x10^{-4}$ and $5x10^{-4}$, respectively). Arsenic and benzene were the primary contributors to the excess risk for mean concentrations, while arsenic, benzene, and carbon tetrachloride were primary contributors at maximum concentrations. At both

mean and maximum concentrations, only arsenic produced individual risks above $1x10^{-4}$. In downgradient groundwater, exposure to both mean and maximum concentrations produced risks within the USEPA range ($1x10^{-5}$ and $3x10^{-5}$, respectively).

If the modified CSF for arsenic was used to estimate excess lifetime cancer risks, then the cancer risks associated with exposure to both average and maximum concentrations of arsenic in unfiltered and filtered groundwater would fall below $1x10^{-4}$.

Estimated noncarcinogenic risks exceeded the USEPA target level of 1 for both source area and downgradient unfiltered groundwater at mean and maximum concentrations. HIs for the source area are 25 and 53 for exposure to mean and maximum concentrations, respectively. Benzene, manganese, iron, and arsenic are the primary contributors for source area groundwater. HIs for downgradient groundwater are 2 and 7 for mean and maximum concentrations, respectively. Manganese and benzene are the primary contributors for downgradient groundwater. Individual HQs for the primary contributors in both source area and downgradient groundwater all exceed the USEPA target level of 1.

For filtered groundwater, estimated noncarcinogenic risks exceeded the USEPA target level of 1 for both source area and downgradient groundwater at mean and maximum concentrations. HIs for the source area are 24 and 52 for exposure to mean and maximum concentrations, respectively. Benzene and manganese are primary contributors at mean concentrations, while benzene, manganese and arsenic are the primary contributors for maximum concentrations of filtered source area groundwater. HIs for downgradient groundwater are 2 and 6 for mean and maximum concentrations, respectively. Manganese is the only contributor with an HQ exceeding 1.

A comparison of detected concentrations of CPCs in source area and downgradient groundwater to federal and state drinking water standards and guidelines showed several exceedances. In source area groundwater, the following CPCs were detected at concentrations above a federal or state standard or guideline: benzene, ethylbenzene, toluene, carbon tetrachloride, chloroform, arsenic, cadmium, lead, sodium, aluminum, iron, and manganese. In downgradient groundwater, detected concentrations of benzene, chloroform, aluminum, iron, and manganese exceed federal or state drinking water standards or guidelines.

VII. DEVELOPMENT AND SCREENING OF ALTERNATIVES

A. Statutory Requirements/Response Objectives

Under its legal authorities, the Army's primary responsibility at Superfund sites is to undertake remedial actions that are protective of human health and the environment. In addition, Section 121 of CERCLA establishes several other statutory requirements and preferences, including: a requirement that the remedial action, when complete, must comply with all federal and more stringent state environmental standards, requirements, criteria, or limitations, unless a waiver is invoked; a requirement that a remedial action be cost-effective and use permanent solutions and alternative treatment technologies or resource recovery technologies to the maximum extent practicable; and a preference for remedies in which treatment permanently and significantly reduces the toxicity, mobility, or volume of hazardous substances as a principal element. Response alternatives were developed to be consistent with these Congressional mandates.

Based on preliminary information relating to types of contaminants, environmental media of concern, and potential exposure pathways, remedial response objectives were developed to aid in the development and screening of alternatives. These remedial response objectives were developed to mitigate existing and future potential threats to human health and the environment. The response objectives are:

- Protect potential commercial/industrial receptors, located on Army property, from exposure to contaminated groundwater having chemicals in excess of maximum contaminant levels (MCLs).

- Protect potential commercial/industrial receptors located off Army property from exposure to groundwater having chemicals in excess of MCLs.

- Prevent contaminated groundwater having chemicals in excess of MCLs from migrating off Army property.

Response objectives were not identified for surface soil, subsurface soil, or air. The risk assessments did not identify potential risks from exposure to surface soil or subsurface soil, and ambient air monitoring during the RI did not identify airborne contaminants.

B. Technology and Alternative Development and Screening

CERCLA and the National Oil and Hazardous Substances Pollution Contingency Plan (NCP) set forth the process by which remedial actions are evaluated and selected. In accordance with these requirements, a range of alternatives were developed for both AOC 43G and 43J. The NCP reaffirms CERCLA's preference for permanent solutions that use treatment technologies to reduce the toxicity, mobility, and volume of hazardous substances to the maximum extent practical. With respect to source control, the contaminated soil found below the former gasoline USTs at AOC 43G was found to be 20 to 30 feet bgs. The excavation and treatment of soil from such a depth was determined to be impractical in the FS. However, additional investigation will be conducted as part of the intrinsic bioremediation assessment. The investigation will assess the nature and distribution of contaminants below the former gasoline USTs, and the potential effects on the intrinsic bioremediation alternative.

The residual soil contamination detected at AOC 43J was found to be at/or below groundwater contaminant concentration. Because of this, the excavation of the residual soil contamination would not aid in the natural biodegradation of the site contaminants.

With respect to groundwater, the FS for AOC 43G and the FS for AOC 43J developed several remedial alternatives that attain site-specific cleanup levels using different technologies and a No Action alternative. The alternatives in each FS used intrinsic bioremediation as the primary remedial action, with additional technologies added to reduce the time needed to attain risk-based contaminant levels. Except for the No Action alternative, all the alternatives also included institutional controls, long-term maintenance, and environmental monitoring programs.

Section 3 of each FS identified, assessed, and screened technologies and process options based on implementability, effectiveness, and cost. In Section 4 of each FS, these technologies and process options were combined into the candidate alternatives listed below for each AOC.

1. AOC 43G

- Alternative 1: No Action
- Alternative 2A: Intrinsic Bioremediation

- Alternative 2B: Intrinsic Bioremediation/Soil Venting of Gasoline UST Soils
- Alternative 3: Groundwater Collection and Treatment/Intrinsic Bioremediation
- Alternative 4: Intrinsic Bioremediation/Hydraulic Containment
- Alternative 5: Groundwater Collection and Treatment/Soil Treatment

2. AOC 43J

- Alternative 1: No Action
- Alternative 2: Intrinsic Bioremediation
- Alternative 3: Intrinsic Bioremediation/Passive In-Situ Bioremedial Containment
- Alternative 4: Intrinsic Bioremediation/Hydraulic Containment

The alternatives were then evaluated and screened in Section 4 of each FS based on implementability, effectiveness, and cost, as described in Section 300.430(e)(4) of the NCP. From this screening process, each remedial alternatives was retained for detailed analysis.

VIII. DESCRIPTION OF ALTERNATIVES

This section provides a narrative summary of each alternative evaluated in detail in the FS completed for AOC 43G and AOC 43J. A detailed assessment of each alternative can be found in Sections 4 and 5 in each AOC's FS report.

A. AOC 43G

1. Alternative 1: No Action

The No Action alternative serves as a baseline alternative with which to compare other remedial alternatives for AOC 43G. The No Action alternative does not contain any additional remedial action components to reduce or control potential risks. Existing activities to maintain existing systems and monitor for potential contaminant migration would be discontinued. The No Action alternative does not require any capital or operation and maintenance (O&M) expenditures.

2. Alternative 2A: Intrinsic Bioremediation

Intrinsic bioremediation is the principal component proposed in Alternative 2A to prevent CPCs that exceed groundwater cleanup levels from potentially migrating off Army property or an area located sufficiently inside the boundary in which compliance will be determined, according to cleanup criteria stated in the Record of Decision, that at minimum will meet drinking water standards. The installation of additional monitoring wells and implementation of a long-term groundwater monitoring program will enable assessment of the biodegradation progress and permit detection of any potential migration of contaminants beyond the Devens Reserve Forces Area boundary. Key components of this alternative include:

- intrinsic bioremediation
- intrinsic bioremediation assessment data collection and groundwater modeling
- installing additional groundwater monitoring wells
- long-term groundwater monitoring
- annual data reports to USEPA and MADEP
- five-year site reviews

Direct capital costs for Alternative 2A include the cost to collect the intrinsic bioremediation assessment data, perform the modeling, mobilize a drill rig and install new groundwater monitoring wells. O&M costs include maintenance of the groundwater monitoring wells, long-term groundwater monitoring, and five-year site reviews.

Total Direct and Indirect Costs: $39,000
Present Worth of O&M costs: $406,300
Total Present Worth: $445,300 (30 years)

3. Alternative 2B: Intrinsic Bioremediation/Soil Venting of Gasoline UST Soils

Like Alternative 2A, intrinsic bioremediation is the principal component proposed in Alternative 2B to prevent CPCs that exceed groundwater cleanup levels from potentially migrating off Army property or an area located sufficiently inside the boundary in which compliance will be determined, according to cleanup criteria stated in the Record of Decision, that at minimum will meet drinking water standards. However, Alternative 2B also includes installation of an soil vapor extraction (SVE) system to reduce residual contaminant concentrations in soils below the former gasoline USTs. The objective of the SVE system is to remediate the gasoline UST vadose zone soils to prevent further potential contamination of the aquifer. The soils that contain VOCs may contribute to groundwater contamination during periods of high water table conditions. Minimizing the potential re-contamination of groundwater will improve the effectiveness of intrinsic bioremediation. The following specific actions are included in Alternative 2B:

- intrinsic bioremediation
- intrinsic bioremediation assessment data collection/groundwater modeling
- installing additional groundwater monitoring wells
- SVE treatment system installation and operation
- soil vapor monitoring
- long-term groundwater monitoring
- annual data reports to USEPA and MADEP
- five-year site reviews

Direct capital costs for Alternative 2B include all the costs discussed for Alternative 2A plus expenses incurred for design, construction, and maintenance of the SVE system.

O&M costs for the SVE system include biweekly site visits by a technician, carbon use and disposal, monthly gas chromatograph (GC) analysis of the air streams and measurements from the SVE monitoring wells.

Total Direct and Indirect Costs: $137,600

Present Worth of O&M costs: $473,900
Total Present Worth: $611,500 (30 years)

4. Alternative 3: Groundwater Collection and Treatment/Intrinsic Bioremediation

Alternative 3 for AOC 43G is designed to reduce potential future human health risks by using groundwater extraction to hydraulically intercept and to treat the contaminant plume immediately downgradient of the source areas. Intrinsic bioremediation would be used to degrade CPCs below PRGs farther downgradient or to minimize the potential for further migration of the plume. This alternative is similar to Alternative 2A except the plume near the source would be intercepted hydraulically rather than relying on intrinsic bioremediation to treat the plume near the source area. Based on the continual source simulation of the solute transport model, more then 30 years is expected to be required to remove all the contamination in the aquifer using pumping remediation and intrinsic bioremediation (Appendix C of the Final FS). The CERCLA default value of 30 years was used for cost estimating purposes. Extraction wells would be positioned within the higher contaminated portion of the plume and spaced to intercept the plume from the source area. The following specific actions are included in Alternative 3:

- intrinsic bioremediation
- intrinsic bioremediation assessment data collection and design
- groundwater treatment facility construction
- groundwater treatment facility operation and maintenance
- installing additional groundwater monitoring wells
- long-term groundwater monitoring
- annual data reports to USEPA and MADEP
- five-year site reviews

Direct capital costs for Alternative 3 include the costs to collect the predesign data, perform hydrogeologic and intrinsic biodegradation modeling, and to design and construct the groundwater extraction/treatment system described above. Components include the building, equipment, extraction wells, trenching, and connection to the sanitary sewer. Also included are expenses for mobilizing a drill rig to install new groundwater monitoring wells.

O&M costs for the groundwater extraction and treatment facility include weekly site visits by a technician, carbon use of approximately 21 change-outs per year (based on a

VOC concentration equivalent to 4.4 milligrams per liter [mg/L] of benzene), disposal of the bag filters as a special waste, monthly VOC sampling and analysis, reporting, and waste water treatment facility (WWTF) user fee. Other O&M costs include long-term groundwater monitoring, and five-year site reviews.

Total Direct and Indirect Costs: $257,600
Present Worth of O&M costs: $1,444,900
Total Present Worth: $1,702,500

5. Alternative 4: Intrinsic Bioremediation/Hydraulic Containment

Alternative 4 for AOC 43G is designed to reduce potential future human health risks. In addition to the components of Alternative 3, this alternative provides installation of passive in-situ bioremediation wells to reduce potential future risk to downgradient receptors from potentially contaminated groundwater. The following specific actions are included in Alternative 4:

- intrinsic bioremediation
- installing passive in-situ bioremediation wells
- passive in-situ bioremediation system maintenance
- intrinsic bioremediation assessment data collection and design
- groundwater treatment facility construction
- groundwater treatment facility operation and maintenance
- installing additional groundwater monitoring wells
- long-term groundwater monitoring
- annual data reports to USEPA to MADEP
- five-year site reviews

In addition to cost items listed for Alternative 3, Alternative 4 direct capital costs include expenses for predesign treatability testing and installation of 20 passive bioremediation wells and 16 piezometers. Additional O&M costs include purchase of the oxygen-releasing compound and nutrients, and maintenance of these wells. Maintenance expense assumes five oxygen-releasing compound/nutrient exchanges and one surge/acid treatment per year.

Total Direct and Indirect Costs: $387,400
Present Worth of O&M costs: $2,139,800

Total Present Worth: $2,527,200 (30 years)

6. Alternative 5: Groundwater Collection and Treatment/Soil Treatment

Alternative 5 involves installation of a groundwater extraction and treatment system as detailed in Alternative 4. As previously discussed in Alternative 4, residual contamination may be left on the soil above the water table when the groundwater in the plume area is lowered during groundwater extraction. Alternative 4 includes installation of an SVE system to remediate contaminated soils which will be left above the lowered groundwater table. The objectives of groundwater extraction and treatment are: a) to halt/minimize the migration of the contamination plume (hydraulic control), and b) to remediate the aquifer. The objective of soil venting is to remediate the vadose zone and to prevent recontamination of the groundwater upon rebounding of the aquifer. The combination of groundwater extraction and treatment, SVE, and intrinsic bioremediation will minimize the potential of off-site migration of groundwater CPCs and remediate site soil and groundwater. The following specific actions are included in Alternative 5:

- intrinsic bioremediation assessment data collection and design
- SVE treatment system installation
- groundwater treatment facility construction
- installing additional groundwater monitoring wells
- groundwater treatment facility O&M
- soil monitoring
- long-term groundwater monitoring
- five-year site reviews
- annual data reports to USEPA and MADEP
- intrinsic bioremediation

Direct capital costs for Alternative 5 include all the costs discussed for Alternative 4 plus expenses incurred for pilot testing, design, and construction of the SVE system.

O&M costs for the SVE system include weekly site visits by a technician, carbon use and disposal, monthly GC analysis of the air streams, semi-annual measurements from the soil vapor monitoring wells and reporting over a two year period. O&M costs included for Alternative 4 also apply to Alternative 5.

Total Direct and Indirect Costs: $388,000

Present Worth of O&M costs: $1,489,900
Total Present Worth: $1,877,900 (27 years treatment/29 years monitoring)

B. AOC 43J

1. Alternative 1: No-Action

The No Action alternative does not contain any remedial action components beyond the existing site conditions to reduce or control potential risks. No institutional controls would be implemented to prevent future human exposure, and existing activities to maintain existing systems and monitor for potential future migration of site-related contaminants of Army property. Alternative 1 is developed to provide a baseline for comparison with the other remedial alternatives. The No Action alternative does not require any capital or O&M expenditures.

2. Alternative 2: Intrinsic Bioremediation

Intrinsic bioremediation is the principal component in Alternative 2 that is proposed to reduce contaminants on Army property to below PRGs, and also to prevent potential migration of contaminants above PRGs off Army property. The installation of additional monitoring wells and implementation of a long-term groundwater monitoring program will enable assessment of the biodegradation progress and permit detection of any potential migration of contaminants beyond the Army boundary. Key components of this alternative include:

- intrinsic bioremediation
- intrinsic bioremediation assessment data collection and groundwater modeling
- installing additional groundwater monitoring wells
- long-term groundwater monitoring
- annual data reports to USEPA and MADEP
- five-year site reviews

Direct capital costs for Alternative 2 include the cost to collect the intrinsic bioremediation assessment data, perform the modeling, mobilize a drill rig and install new groundwater monitoring wells. Costs for O&M include maintenance of the

groundwater monitoring wells, long-term groundwater monitoring, and five-year site reviews.

Total Direct and Indirect Costs: $47,200
Present Worth of O&M costs: $394,500
Total Present Worth: $441,700 (27 years treatment/29 years monitoring)

3. Alternative 3: Intrinsic Bioremediation/Passive In-situ Bioremedial Containment

Alternative 3 for AOC 43J is designed to reduce potential future human health risks. In addition to the components of Alternative 2, this alternative provides installation of passive in-situ bioremediation wells to reduce potential future risk to downgradient receptors from potentially contaminated groundwater. The following specific actions are included in Alternative 3:

- intrinsic bioremediation
- installing passive bioremediation wells
- passive in-situ bioremediation system maintenance
- intrinsic bioremediation assessment data collection and groundwater modeling
- installing additional groundwater monitoring wells
- long-term groundwater monitoring
- annual data reports to USEPA and MADEP
- five-year site reviews

In addition to cost items listed for Alternative 2 above, Alternative 3 direct capital costs include expenses for predesign treatability testing and installation of 20 passive bioremediation wells and 16 piezometers. Additional O&M costs include purchase of the oxygen releasing compound and nutrients, and maintenance of these wells.

Maintenance expense assumes five oxygen releasing compound/nutrient exchanges and one surge/acid treatment per year.

Total Direct and Indirect Costs: $134,600
Present Worth of O&M costs: $1,003,400
Total Present Worth: $1,138,000 (27 years treatment/29 years monitoring)

4. Alternative 4: Intrinsic Bioremediation/Hydraulic Containment

Alternative 4 for AOC 43J is designed to reduce potential future human health risks by using intrinsic bioremediation to degrade CPCs below groundwater cleanup levels on-site and using groundwater extraction and treatment to hydraulically contain and also to treat the contaminant plume. This alternative is similar to Alternative 3, except the plume would be contained hydraulically rather than by aerobic biodegradation to reduce potential future risk to downgradient receptors. Calculations based on site soil and contaminant characteristics reveal that up to 56 years may be required to remove all the contamination in the aquifer using pumping remediation alone (no abiotic removal or biological degradation effects) (Appendix D of the Final FS). Intrinsic bioremediation is expected to reduce CPCs to below groundwater cleanup levels in less time as will be detailed below. Therefore, the groundwater extraction and treatment component in this alternative serves more for hydraulic containment of the contaminant plume while reduction of contaminant concentrations would be shared both by intrinsic bioremediation and groundwater extraction. Extraction wells would be positioned within the higher contaminated portion of the plume to maximize treatment efficiency for this alternative. The following specific actions are included in Alternative 4:

- intrinsic bioremediation
- intrinsic bioremediation assessment data collection and design
- groundwater treatment facility construction
- groundwater treatment facility operation and maintenance
- installing additional groundwater monitoring wells
- long-term groundwater and soil monitoring
- annual data reports in USEPA and MADEP
- five-year site reviews

A cost estimate was prepared for Alternative 4 to assist in selecting a remedial alternative. Remedial action is expected to exceed the 30-year default period specified

in USEPA guidance for cost analyses purposes. However, because the remedial time frames for Alternatives 2, 3, and 4 were evaluated using the same or similar modeling techniques and assumptions, the actual estimated time of 36 years (38 years for groundwater monitoring) will be used so that the costs between alternatives may be evaluated on an equal basis. (i.e., Alternatives 2 and 3 are expected to take up to 27 years for site mitigation). Comparing costs incurred for this period with costs incurred for a default period of 30 years for Alternative 4 would appear to be a biased analysis.

Direct capital costs for Alternative 4 include the costs to collect the predesign data, perform hydrogeologic modeling, and to design and construct the groundwater extraction/treatment system described above. Components include the building, equipment, extraction wells, trenching, and connection to the sanitary sewer. Also included are expenses for mobilizing a drill rig to install new groundwater monitoring wells.

O&M costs for the groundwater extraction and treatment facility include weekly site visits by a technician, carbon use of four to five change-outs per year (based on a VOC concentration equivalent to 2.9 mg/L of benzene), disposal of the bag filters as a special waste, monthly VOC sampling and analysis, reporting, and WWTF user fee. Other O&M costs include long-term groundwater monitoring (analysis for CPCs once per year), long-term soil sampling (assumed frequency one sampling round of 10 soil samples each, every five years) and five-year site reviews.

Total Direct and Indirect Costs: $270,100
Present Worth of O&M costs: $1,433,700
Total Present Worth: $1,703,800

IX. SUMMARY OF THE COMPARATIVE ANALYSIS OF ALTERNATIVES

Section 121(b)(1) of CERCLA presents several factors that at a minimum the Army is required to consider in its assessment of alternatives. Building upon these specific statutory mandates, the NCP articulates nine evaluation criteria to be used in assessing the individual remedial alternatives. The nine criteria are used to select a remedy that meets the goals of protecting human health and the environment, maintaining protection over time, and minimizing untreated waste.

A detailed analysis was performed on the alternatives using the nine evaluation criteria to select a site remedy. Specific discussion regarding this analysis is provided in Section 5 of each FS report. Definitions of the nine criteria are provided below:

Threshold Criteria

The two threshold criteria described below must be met in order for an alternative to be eligible for selection in accordance with the NCP.

- Overall Protection of Human Health and the Environment - Assesses how well an alternative, as a whole, achieves and maintains protection of human health and the environment.

- Compliance with Applicable or Relevant and Appropriate Requirements (ARARs) - Assesses how the alternative complies with location-, chemical-, and action-specific ARARs, and whether a waiver is required or justified.

Primary Balancing Criteria

The following five criteria are used to compare and evaluate the elements of alternatives that meet the threshold criteria.

- Long-Term Effectiveness and Permanence - Evaluates the effectiveness of the alternative in protecting human health and the environment after response objectives have been met. This criterion includes consideration of the magnitude of residual risks and the adequacy and reliability of controls.

- Reduction of Toxicity, Mobility, and Volume Through Treatment - Evaluates the effectiveness of treatment processes used to reduce toxicity, mobility, and volume of hazardous substances. This criterion considers the degree to which treatment is irreversible, and the type and quantity of residuals remaining after treatment.

- Short-Term Effectiveness - Examines the effectiveness of the alternative in protecting human health and the environment during the construction and implementation of a remedy until response objectives have been met.

Considers the protection of the community, workers, and the environment during implementation of remedial actions.

- Implementability - Assesses the technical and administrative feasibility of an alternative and availability of required goods and services. Technical feasibility considers the ability to construct and operate a technology and its reliability, the ease of undertaking additional remedial actions, and the ability to monitor the effectiveness of a remedy. Administrative feasibility considers the ability to obtain approvals from other parties or agencies and extent of required coordination with other parties or agencies.

- Cost - Evaluates the capital, and operation and maintenance costs of each alternative.

Modifying Criteria

The modifying criteria are used on the final evaluation of remedial alternatives generally after the Army has received public comments on the FS and proposed plan.

- State Acceptance - This criterion considers the state's preferences among or concerns about the alternatives, including comments on ARARs or the proposed use of waivers.

- Community Acceptance - This criterion considers the communities preferences among or concerns about the alternatives.

Following the detailed analysis of each individual alternative, the Army conducted a comparative analysis, focusing on the relative performance of each alternative against the nine criteria. Table 5-1 in each FS report summarizes the comparative analysis. This comparative analysis of the alternatives for each AOC are also summarized below.

A. AOC 43G

1. Overall Protection of Human Health and the Environment

This criterion, according to CERCLA, must be met for a remedial alternative to be chosen as a final site remedy. At AOC 43G, groundwater sampling has shown that contaminants exceed PRGs on Army property; however, no current commercial/ industrial exposure to groundwater exists because there are no drinking water wells installed on-site. Also, no future exposure to groundwater on-site is anticipated. The site is to remain Army property and will continue to be used to support Army Reserve activities. There are no future plans to install water supply wells on-site to support these activities. Groundwater analysis results indicate that intrinsic biodegradation is likely occurring naturally at AOC 43G. Should the Army change the use at either AOC, additional assessment and/or remedial actions may be required based upon the changed risk factors resulting from this change in use. In addition, if the Army transfers either site by lease or deed then an EBS will need to be conducted, and a determination will be made by the Army and USEPA that the selected remedy remains protective of human health and the environment. The EBS will be provided to the USEPA and MADEP for comment.

Calculations reveal that concentrations exceeding groundwater cleanup levels will not likely migrate beyond the Army's boundary, thereby protecting downgradient receptors from future exposure to CPCs. Calculations also indicate that organic CPCs may potentially be reduced below groundwater cleanup levels over time on-site as a result of the intrinsic biodegradation process (see Appendix C of the Final FS). Because intrinsic biodegradation is a naturally occurring process, all alternatives consider it as a remedial component. However, the degree to which each alternative relies on intrinsic bioremediation varies. Some of the alternatives rely on backup components to achieve PRGs if intrinsic biodegradation does not perform as anticipated. Therefore, all alternatives are considered protective of human health and the environment.

Although Alternative 1 proposes no action, intrinsic bioremediation would likely prevent future potential exposure to contaminated groundwater. However, there would be no method to assess the protectiveness of this alternative because there would be no groundwater monitoring performed. Alternative 2A would use additional data collection, modeling, long-term groundwater monitoring, and five-year site reviews to ensure that intrinsic bioremediation is protective of human health and the environment. The additional soil investigation below the former USTs at AOC 43G, will be used to help determine if an SVE system is needed to aid the intrinsic bioremediation alternative. If the existing groundwater contamination appears to be migrating off Army property or an area located sufficiently inside the boundary in which compliance will be determined,

according to cleanup criteria stated in the Record of Decision, that at minimum will meet drinking water standards, the addition of the SVE system will be considered. Alternatives 2B, 3, and 4 add supplemental or backup treatment components in addition to their reliance on intrinsic bioremediation. Alternative 2B adds soil venting of the soils below the former gasoline USTs to minimize the potential of groundwater recontamination. Alternative 3 adds groundwater collection and treatment as a means of intercepting the most contaminated portion of the plume to minimize the potential for migration of CPCs that exceed MCLs or MMCLs. Alternative 4 uses passive bioremediation (aerobic treatment) at the plume edge to minimize migration potential. The added technologies in Alternatives 2B, 3, and 4 increase the potential protection of downgradient receptors, although each could also be added as additional alternatives upon nonperformance of intrinsic biodegradation without jeopardizing overall protection of human health and the environment.

2. Compliance with Applicable or Relevant and Appropriate Requirements

CERCLA requires that the selected alternative also meet a second threshold criterion of compliance with ARARs, or obtain a waiver if the criterion cannot be met. No location-specific ARARs are triggered for remedial activities at AOC 43G. Organic CPC concentrations could be reduced to below federal and Massachusetts drinking water Maximum Contaminant Levels (MCLs) and MMCLs by biological degradation depending upon modeling results and if the source area has been successfully removed. Inorganic CPCs in groundwater may also revert to more insoluble forms upon reduction of organic concentrations and meet MCLs, MMCLs, and Massachusetts Groundwater Quality Criteria (314 CMR 6.00).

Alternatives 2A through 4 would use groundwater monitoring to evaluate long-term effectiveness and the potential for CPC migration off Army property. Monitoring would be in compliance with substantive portions of the Massachusetts Hazardous Waste Management Rules 310 CMR 30.660 - 30.670 relating to the development of a groundwater monitoring plan. Alternatives 2B, 3, and 4 would need to meet additional action-specific ARARs because of the additional technologies used. Alternative 2B would use a soil venting treatment system (vapor phase activated carbon) to comply with the Massachusetts Air Pollution Control Regulations (310 CMR 6.00 - 7.00). These regulations require a minimum 95 percent reduction (by weight) in VOCs in the air effluent air stream. Additionally, spent activated carbon would be tested to meet

disposal requirements in accordance with Resource conservation and Recovery Act (RCRA) Land Disposal Restrictions (40 CFR 268). Alternative 3 groundwater treatment discharge would meet the requirements of the Clean Water Act, General Pretreatment Program (40 CFR Part 403). Similar to Alternative 2B, Alternative 3 treatment wastes (spent activated carbon, filtered material, sludge) would be tested for proper disposal (40 CFR 268). Engineering controls (dust suppression) would be used to comply with Massachusetts Air Pollution Control Regulations (310 CMR 6.00 - 7.00) which would regulate particulate emissions during site construction activities. Alternative 4 would be in general compliance with the Underground Injection Control Program (40 CFR Parts 144 & 146), the Underground Water Source Protection Standards (310 CMR 27.00) plus those regulations specified for Alternative 3.

3. Long-term Effectiveness and Permanence

This criterion evaluates the magnitude of residual risk and the reliability of controls after response objectives have been met. In the microbial degradation process of intrinsic bioremediation, the organic CPCs are converted ultimately to inert compounds such as carbon dioxide, methane, and water. Inorganic CPCs will revert to more insoluble forms following completion of organic degradation. Because of the actual degradation/ destruction of organic contaminants that occurs in this process, intrinsic bioremediation provides permanent treatment effectiveness without secondary waste disposal. Alternatives 2B, 3, and 4 which use supplemental technologies (SVE or groundwater extraction and treatment) have secondary waste (i.e., spent activated carbon and sludge) that will require disposal.

4. Reduction of Toxicity, Mobility, and Volume through Treatment

This criterion evaluates whether the alternatives meet the statutory preference for treatment under CERCLA. The criterion evaluates the reduction of toxicity, mobility, or volume of contaminants, and the type and quantity of treatment residuals. All alternatives meet the statutory preference for treatment under CERCLA, because intrinsic bioremediation is a naturally occurring process for all alternatives evaluated. Alternatives 2B, 3, and 4 offer supplemental or back-up treatment processes which also contribute to the reduction of toxicity, mobility and volume of contaminants.

Alternatives 2B, 3, and 4 would generate concentrated waste streams (i.e., sludge, filtered material, and/or spent carbon) that would require disposal.

5. Short-term Effectiveness

CERCLA requires that potential adverse short-term effects to workers, the surrounding community, and the environment be considered during selection of a remedial action. Major adverse short-term effects to site workers are not expected for any of the alternatives because all activities can be monitored readily and engineering control implemented in accordance with a Health and Safety Plan. However, because of more intrusive activities, monitoring requirements and construction work, the potential for contaminant exposure and safety hazards to workers increases with Alternatives 2A, 2B, 3, and 4, respectively. Alternatives 2B and 3 require installation of twice the number of wells required by Alternative 2A. Alternatives 2B, 3, and 4 also utilize active treatment processes that require more frequent contact with contaminated medium during O&M and monitoring activities.

For costing purposes, Alternatives 2A, 2B, 3, and 4 are all assumed to require greater than 30 years to meet remedial objectives.

6. Implementability

This criterion evaluates each alternative's ease of construction and operation and availability of services, equipment, and materials to construct and operate the alternative. Also evaluated is the ease of undertaking additional remedial actions and administrative feasibility.

Although the engineering complexity increases for each alternative (i.e., Alternative 4 > Alterative 3 > Alternative 2B > Alternative 2A > Alternative 1), engineering and construction services, equipment, and materials should be readily available to implement any of the alternatives. Alternatives 2A through 4 all require additional data collection, modeling or pilot testing prior to design and implementation. Alternatives 2A through 4 would require additional data collection and intrinsic bioremediation modeling to refine biodegradation rates following removal of the sand and gas trap with associated soils. Alternatives 3 and 4 both require additional groundwater pumping tests and

hydrogeological modeling to verify flow rates and quantity and placement of extraction wells to hydraulically contain the contaminant plume. Alternative 4 would also require, as a minimum, laboratory treatability testing to assess oxygen-releasing compounds and nutrient needs. Limited pilot testing may be required to verify field application of oxygen-releasing compounds and nutrients.

Groundwater monitoring to assess the success of remedial action is performed easily for all alternatives. None of the alternatives would limit or interfere with the ability to perform future remedial actions. All alternatives would require coordination among regulatory agencies to institute the five-year review process.

7. Cost

There are no costs associated with Alternative 1. Capital, O&M, and present worth costs were estimated for Alternatives 2A through 4. Cost estimates for these alternatives included similar expense for long-term groundwater monitoring. As would be expected, Alternatives 2A and 4 are the least and most expensive alternatives, respectively. The alternative with the lowest capital cost is Alternative 2A because it does not include extensive construction activities. Alternative 4 has the highest capital cost because it includes the design and construction of a groundwater extraction/treatment system and passive bioremediation system. Alternatives 3 and 4 both have high O&M costs because of long-term maintenance of the groundwater treatment and passive bioremediation systems.

After calculating the present worth for each alternative, the sensitivity of the costs to the estimating assumptions was evaluated. The total cost associated with all alternatives consist primarily of long-term O&M and/or groundwater monitoring costs. These long-term costs contribute between approximately 75 percent and 90 percent to the overall total cost. A high degree of uncertainty is associated with the length of time required to reduce contaminants to below PRGs. The effects from possible residual contamination within the bedrock fractures cannot yet be recognized. A 30-year remediation time was conservatively used for costing purposes. The estimate of four years for intrinsic bioremediation ("on/off" source simulation) is believed to be also based on conservative assumptions, but assumes that there is no continuous source (see Appendix C in the Final FS). This shorter treatment period would significantly reduce O&M costs and total present worth costs proportionally for all alternatives. The relative comparison between

alternatives would remain similar. Therefore, further sensitivity analysis to assess effects from "across the board" remedial action time reduction was not performed for these alternatives.

It is also noted that expenses incurred for Alternative 4 assume that oxygen-releasing compounds and nutrient application would be required for the entire 30-year remedial action time period (assumes that intrinsic biodegradation is not capable of containing the plume for the entire 30 years). Numerous other scenarios are equally likely and could include: 1) biodegradation within the plume area could occur to the extent that the contaminant plume would shrink in size within five years, 2) and that maintenance of the bioremediation wells would not be required for the remaining duration of 25 years that it would take to reduce CPCs below PRGs. Reducing need for aerobic treatment time would significantly reduce O&M costs for Alternative 4. The total present worth could be reduced to approximately 30 percent of the full 30-year total present worth.

8. State Acceptance

This criterion addresses whether, based on its review of the RI, FS, and proposed plan, the state concurs with, opposes, or has no comment on the alternative the Army is proposing as the remedy for AOC 43G. The Commonwealth of Massachusetts has reviewed the RI, FS, proposed plan, and this Record of Decision and concurs with the selected remedy.

9. Community Acceptance

This criterion addresses whether the public concurs with the Army's proposed plan. No comments were received from the community during the public comment period. The Army believes this shows community acceptance of the proposed plan and selected remedy.

B. AOC 43J

1. Overall Protection of Human Health and the Environment

This criterion, according to CERCLA, must be met for a remedial alternative to be chosen as a final site remedy. At AOC 43J groundwater sampling has shown that contaminants exceed groundwater cleanup levels on Army property; however, no current commercial or industrial exposure to groundwater exists because there are no drinking water wells installed on site. Also, no future exposure to groundwater on site is anticipated. The site is to remain Army property and will continue to be used to support Army Reserve activities. There are no future plans to install water supply wells on site to support these activities. Groundwater analysis results indicate that intrinsic biodegradation is currently occurring naturally at AOC 43J.

Calculations indicate that organic CPCs will be reduced below groundwater cleanup levels over time as a result of the intrinsic biodegradation process. Calculations also reveal that concentrations exceeding groundwater cleanup levels will not likely migrate beyond the Army's boundary, thereby protecting downgradient receptors from future exposure to CPCs. Because intrinsic biodegradation is a naturally occurring process, all alternatives consider it at as a remedial component. However, the degree to which each alternative relies on intrinsic bioremediation varies. Some of the alternatives rely on redundant or backup components to achieve groundwater cleanup levels if intrinsic biodegradation does not perform as anticipated. Therefore, all alternatives are considered protective of human health and the environment.

Although Alternative 1 proposes no action, intrinsic bioremediation would likely result in attainment of groundwater cleanup levels. However, there would be no method to assess the protectiveness of this alternative because there would be no groundwater monitoring performed. Alternative 2 would use additional data collection, modeling, long-term groundwater monitoring, five-year site reviews and contingencies for additional action to ensure that intrinsic bioremediation is protective of human health and the environment. Alternatives 3, 4 and 5 add more active response actions as redundant or backup components in addition to their reliance on intrinsic bioremediation. Alternative 3 adds passive bioremediation (aerobic treatment) at the plume edge to minimize migration potential. Alternatives 4 and 5 add groundwater extraction/treatment and groundwater extraction/treatment combined with SVE, respectively. The added technologies in Alternatives 3, 4, and 5 increase the potential protection of downgradient receptors, although each could also be added as contingency alternatives upon nonperformance of intrinsic biodegradation, outlined in Alternative 2, without jeopardizing overall protection of human health and the environment.

2. Compliance with Applicable or Relevant and Appropriate Requirements

CERCLA requires that the selected alternative also meet a second threshold criterion of compliance with ARARs, or obtain a waiver if the criterion can not be met. No location-specific ARARs are triggered for remedial activities at AOC 43J. All alternatives rely on intrinsic bioremediation to comply with chemical-specific ARARs within the mitigation time-frames presented for each alternative. (Groundwater extraction and treatment without considering intrinsic biodegradation would require a longer time-frame to comply with ARARs). Organic CPC concentrations will be reduced to below MCLs and MMCLs by biological degradation. Inorganic CPCs in groundwater will revert to more insoluble forms upon reduction of organic concentrations and meet MCLs and MMCLs, and the Massachusetts Groundwater Quality Criteria (314 CMR 6.00).

Alternatives 2 through 5 would use groundwater monitoring to evaluate long-term effectiveness and the potential for CPC migration off Army property. Monitoring would be in compliance with substantive portions of the Massachusetts Hazardous Waste Management Rules 310 CMR 30.660 - 30.670 relating to the development of a groundwater monitoring plan. Alternatives 3 through 5 would need to meet additional action-specific ARARs because of the additional technologies used. Alternative 3 would be in general compliance with the Underground Injection Control Program (40 CFR Parts 144 & 146) and Underground Water Source Protection Standards (310 CMR 27.00). Alternative 4 groundwater treatment discharge would meet the requirements of the Clean Water Act, General Pretreatment Program (40 CFR Part 403). Treatment wastes (i.e., activated carbon, filtered material, and sludge) would be tested to evaluate if they are classified as a characteristic hazardous waste in accordance with RCRA Land Disposal Restrictions (40 CFR 268). Engineering controls (dust suppression) would be used to comply with Massachusetts Air Pollution Control Regulations (310 CMR 6.00 - 7.00) which would regulate particulate emissions during site construction activities. Alternative 5 would use a soil venting gas treatment system to comply with the Massachusetts Air Pollution Control regulations (310 CMR 7.03). For costing purposes in this FS evaluation, soil venting gas treatment by vapor phase activated carbon was assumed. The air regulations require a minimum 95 percent reduction (by weight) in VOCs in the air effluent stream. Air monitoring would be required to ensure compliance.

3. Long-term Effectiveness and Permanence

This criterion evaluates the magnitude of residual risk and the reliability of controls after response objectives have been met. Alternative 2, as well as all the other alternatives rely on intrinsic bioremediation to achieve the remedial action objectives within the mitigation time-frames presented for each alternative. In the microbial degradation process of intrinsic bioremediation, the organic CPCs are ultimately converted to inert compounds such as carbon dioxide, methane, and water. Inorganic CPCs revert to more insoluble forms following completion of organic degradation. Because of the degradation/destruction of organic contaminants that occurs in this process, intrinsic bioremediation provides permanent treatment effectiveness without secondary waste disposal. Alternative 3 offers no real long-term advantages over Alternative 2. Once PRGs are achieved, bioremediation wells would no longer be used to add oxygen-releasing compounds and nutrients. Alternatives 4 and 5 which use backup technologies of groundwater extraction and treatment and SVE have secondary waste (i.e., activated carbon and sludge) that will require disposal.

Alternatives 4 and 5 would lower the groundwater table by approximately 1 foot. The potential for groundwater recontamination exists when the groundwater table rebounds after groundwater extraction has been halted (if the contamination in the vadose zone soil is not reduced). Soil sampling/monitoring would be performed to evaluate the progressiveness of biodegradation and SVE in the vadose zone for Alternatives 4 and 5, respectively. Any remaining soil contamination may be difficult to detect because of the heterogenous nature of soil and contaminant distribution.

Alternatives 2 and 3 do not lower the groundwater table so the potential for groundwater recontamination is not as likely. All alternatives, except Alternative 1, use long-term groundwater monitoring to ensure that compliance with groundwater cleanup goals, is reached for three consecutive annual sampling rounds.

4. Reduction of Toxicity, Mobility, and Volume through Treatment

This criterion evaluates whether the alternatives meet the statutory preference for treatment under CERCLA. The criterion evaluates the reduction of toxicity, mobility, or volume of contaminants, and the type and quantity of treatment residuals. All alternatives, including Alternative 1 (No Action), meet the statutory preference for treatment under CERCLA because intrinsic bioremediation is a naturally occurring

process for all alternatives evaluated. Alternatives 3, 4 and 5 offer back-up treatment processes which also contribute to the reduction of toxicity, mobility, and volume of contaminants.

Alternatives 4 and 5 would generate concentrated waste streams (i.e., sludge, filtered material, and spent carbon) that would require disposal.

5. Short-term Effectiveness

CERCLA requires that potential adverse short-term effects to workers, the surrounding community, and the environment be considered during selection of a remedial action. Major adverse short-term effects to site workers are not expected for any of the alternatives because all activities can be readily monitored and engineering control implemented in accordance with a Health and Safety Plan. However, because of more intrusive activities, monitoring requirements and construction work, the potential for contaminant exposure and safety hazards to workers increases with Alternatives 2, 3, 4 and 5, respectively. Alternative 3 requires installation of over six times the number of wells required by Alternative 2. Alternatives 4 and 5 utilize active treatment processes that require more frequent contact with contaminated medium during O&M and monitoring activities.

Alternatives 1, 2, 3, and 5 are expected to require 27 years to meet remedial objectives. Alternative 4 is anticipated to require 36 years to meet remedial objectives. (Remediation times are not inclusive of the additional two years of groundwater monitoring required for Alternatives 2 through 5.)

6. Implementability

This criterion evaluates each alternative's ease of construction and operation and availability of services, equipment, and materials to construct and operate the alternative. Also evaluated is the ease of undertaking additional remedial actions and administrative feasibility.

Although the engineering complexity increases for each alternative (i.e., Alternative 5 > Alternative 4 > Alterative 3 > Alternative 2 > Alternative 1), engineering and construction services, equipment, and materials should be readily available to implement any of the alternatives. Alternatives 2 through 5 all require additional data collection,

modeling or pilot testing prior to design and implementation. Alternatives 2 and 3 would require additional data collection and intrinsic bioremediation modeling. Alternative 3 would also require, as a minimum, laboratory treatability testing to assess oxygen-releasing compounds and nutrient needs. Limited pilot testing may also be required to verify field application of oxygen-releasing compounds and nutrients. Alternatives 4 and 5 both require groundwater pumping tests and hydrogeological modeling to verify flow rates and quantity and placement of extraction wells to hydraulically contain the contaminant plume. Alternative 5 also requires performing an SVE pilot test to collect needed design parameters.

Groundwater monitoring to assess the success of remedial action is performed easily for all alternatives. The soil monitoring that is required to assess the potential for groundwater recontamination in Alternatives 4 and 5 is more difficult to achieve because of the heterogenous soil medium and contaminant distribution.

None of the alternatives would limit of interfere with the ability to perform future remedial actions. All alternatives would require coordination among regulatory agencies to institute the five-year review process.

7. Cost

There are not costs associated with Alternative 1. Capital, O&M, and present worth costs were estimated for Alternatives 2 through 5. Cost estimates for these alternatives included similar expense for long-term groundwater monitoring. As would be expected, Alternatives 2 and 5 are the least and most expensive alternatives, respectively. The alternative with the lowest capital cost is Alternative 2 because it does not include extensive construction activities. Alternative 5 has the highest capital cost because it includes the design and construction of a groundwater extraction/treatment system and SVE system. Alternatives 4 and 5 both have high O&M costs because of long-term maintenance of the groundwater treatment and SVE systems. Alternative 3 also has a relatively high O&M cost because of long-term oxygen-releasing compound application and nutrient addition and well maintenance. Total present worth cost for Alternative 4 was less than Alternative 5 even though remedial action time for Alternative 4 is expected to be nine years longer than for Alternative 5. This is because of the expense for SVE O&M is greater than the O&M costs for operating the extraction system to keep the groundwater table depressed (assumes no groundwater treatment required after 27 years).

After calculating the present worth for each alternative, the sensitivity of the costs to the estimating assumptions was evaluated. The total cost associated with all alternatives consist primarily of long-term O&M and/or groundwater monitoring costs. These long-term costs contribute between 80 percent and 89 percent to the overall total cost. A relative high degree of uncertainty is associated with the length of time required to reduce contaminants to below groundwater cleanup levels. The estimate of 27 years for intrinsic bioremediation is based on very conservative assumptions as detailed in Appendix C. Should ethylbenzene degrade as rapidly as the other organic CPCs, remedial objectives could be met within approximately 10 years. This shorted treatment period would reduce O&M costs and total present worth costs proportionally for all alternatives. Therefore, further sensitivity analysis to assess effects from "across the board" remedial action time reduction was not performed for these alternatives.

However, it is noted that expenses incurred for Alternative 3 assume that oxygen-releasing compounds and nutrient application would be required for the entire 27-year remedial action time period. Numerous other scenarios are equally likely (i.e., biodegradation within the plume area could occur to the extent that the contaminant plume would shrink in size within five years and that maintenance of the bioremediation wells would not be required for the remaining duration of 22 years that it would take to reduce CPCs below PRGs). Reducing need for aerobic treatment time would significantly reduce O&M costs for Alternative 3. The total present worth cost could be reduced to approximately 60 percent of the full 27-year total present worth cost (from approximately $1,140,000 to $680,000).

8. State Acceptance

This criterion addresses whether, based on its review of the RI, FS, and proposed plan, the state concurs with, opposes, or has no comment on the alternative the Army is proposing as the remedy for both AOC 43G and 43J. The Commonwealth of Massachusetts has reviewed the RI, FS, proposed plan, and this Record of Decision and concurs with the selected remedy.

9. Community Acceptance

This criterion addresses whether the public concurs with the Army's proposed plan. No comments were received from the community during the public comment period. The

Army believes this shows community acceptance of the proposed plan and selected remedy.

X. THE SELECTED REMEDY

The selected remedy to address groundwater contamination at AOC 43G is Alternative 2A. The selected remedy to address groundwater contamination at AOC 43J is Alternative 2. Each of these alternatives includes components for the monitoring of contaminant degradation and management of contaminant migration. The remedial components of the selected remedy are described in detail below.

A. Groundwater Cleanup Levels

The PRGs for AOC 43G and 43J were developed in the FS following the USEPA guidance documents entitled, *Risk Assessment Guidance for Superfund: Volume 1 - Human Health Evaluation Manual (Part B, Development of Risk Based Preliminary Remediation Goals)*, Interim, December 1991, and OSWER Directive 9355.0-30, *Role of the Baseline Risk Assessment in Superfund Remedy Selection Decisions*. The PRGs will be used in the Record of Decision as groundwater cleanup levels, and will be referred to as such in the remainder of this Record of Decision. The first step in developing groundwater cleanup levels for protection of human health was to identify those environmental media that in the baseline risk assessment presented either a cumulative current or future cancer risk greater than $1x10^{-4}$ or a cumulative noncarcinogenic HI greater than 1, based on reasonable maximum exposure assumptions. The next step was to identify CPCs within the media presenting cancer risks greater than $1x10^{-6}$ or a HQ greater than 1.

1. AOC 43G

A comparison of detected concentrations of CPCs in source area and downgradient groundwater, to federal and state drinking water standards showed several exceedances. In source area groundwater, the following CPCs were detected at concentrations above a federal or state standard: xylenes, benzene, ethylbenzene, arsenic, lead, nickel, aluminum, iron, manganese, and sodium. In downgradient groundwater, detected concentrations of benzene, aluminum, iron, manganese, and sodium exceed federal or state drinking water standards or guidelines.

At AOC 43G estimated noncarcinogenic risks exceeded the USEPA target level of 1 for both source area and downgradient unfiltered groundwater at mean and maximum concentrations. HIs for the source area are 36 and 98 for exposure to mean and maximum concentrations, respectively. Benzene, manganese, iron, and arsenic are the primary risk contributors for source area groundwater. HIs for downgradient groundwater are 11 and 21 for mean and maximum concentrations, respectively. Manganese and benzene are the primary contributors for downgradient groundwater. Individual HQs for the primary contributors in both source area and downgradient groundwater all exceed the USEPA target level of 1.

For filtered groundwater, estimated noncarcinogenic risks exceeded the USEPA target level of 1 for both source area and downgradient groundwater at mean and maximum concentrations. HIs for the source area are 36 and 98 for exposure to mean and maximum concentrations, respectively. Benzene, manganese, iron, and arsenic are the primary contributors for source area groundwater. HIs for downgradient groundwater are 11 and 21 for mean and maximum concentrations, respectively. Manganese and benzene are the primary contributors for downgradient groundwater. Individual HQs for the primary contributors in both source area and downgradient groundwater all exceed the USEPA target level of 1. Based on this assessment, source area PRGs were determined in the FS, for benzene (5 [micrograms per liter] μg/L), ethylbenzene (700 μg/L), xylenes (10,000 μg/L), iron (9,100 μg/L), manganese (291 μg/L), and nickel (100 μg/L). Arsenic and lead were also found to exceed MCLs in source area groundwater, but these exceedances are directly attributable to high levels of TSS in the samples. Because of this, respective PRGs were not developed. PRGs were also established for downgradient groundwater and were limited to benzene (5 μg/L) and manganese (291 μg/L). Lead was also detected, however, these exceedances appear to be attributable to high TSS levels.

A complete discussion of the PRGs is presented in Section 2 of the AOC 43G FS report. Tables 4 and 5 summarize the groundwater cleanup levels for source area and downgradient groundwater at AOC 43G.

2. AOC 43J

In source area groundwater, at AOC 43J, the following CPCs were detected at concentrations above a federal or state standard: benzene, ethylbenzene, toluene, carbon tetrachloride, chloroform, arsenic, cadmium, lead, sodium, aluminum, iron, and

manganese. In downgradient groundwater, detected concentrations of benzene, chloroform, aluminum, iron, and manganese exceed federal or state drinking water standards or guidelines.

Estimated noncarcinogenic risks exceeded the USEPA target level of 1 for both source area and downgradient unfiltered groundwater at mean and maximum concentrations. HIs for the source area are 25 and 53 for exposure to mean and maximum concentrations, respectively. Benzene, manganese, iron, and arsenic are the primary contributors for source area groundwater. HIs for downgradient groundwater are 2 and 7 for mean and maximum concentrations, respectively. Manganese and benzene are the primary contributors for downgradient groundwater. Individual HQs for the primary contributors in both source area and downgradient groundwater all exceed the USEPA target level of 1.

For filtered groundwater, estimated noncarcinogenic risks exceeded the USEPA target level of 1 for both source area and downgradient groundwater at mean and maximum concentrations. HIs for the source area are 24 and 52 for exposure to mean and maximum concentrations, respectively. Benzene and manganese are primary contributors at mean concentrations, while benzene, manganese and arsenic are the primary contributors for maximum concentrations of filtered source area groundwater. HIs for downgradient groundwater are 2 and 6 for mean and maximum concentrations, respectively. Manganese is the only contributor with an HQ exceeding 1. Based on this assessment, PRGs were determined in the FS for benzene (5 μg/L), carbon tetrachloride (5 μg/L), ethylbenzene (700 μg/L), toluene (1,000 μg/L), arsenic (50 μg/L), iron (9,100 μg/L), and manganese (291 μg/L) in the FS report. Cadmium and lead were also found to exceed MCLs in the source area and arsenic in downgradient groundwater. However, these exceedances are directly attributable to high TSS in the samples. Because of this, respective PRG were not developed. PRGs were also established for downgradient groundwater and were limited to benzene (5 μg/L) and manganese (291 μg/L). Arsenic was also detected, however, these exceedances appear to be attributable to high TSS levels.

A complete discussion of the PRGs is presented in Section 2 of the AOC 43G FS report. Tables 6 and 7 summarize the groundwater cleanup levels for source area and downgradient groundwater at AOC 43J.

B. Description of Remedial Components

1. AOC 43G

Alternative 2A: Intrinsic Bioremediation

Intrinsic bioremediation is the principal component in Alternative 2A that is proposed to prevent CPCs that exceed groundwater cleanup levels from potentially migrating off Army property or an area located sufficiently inside the boundary in which compliance will be determined, according to cleanup criteria stated in the Record of Decision, that at minimum will meet drinking water standards. The installation of additional monitoring wells and implementation of a long-term groundwater monitoring program, along with annual reports, will enable assessment of the biodegradation progress, and permit detection of any potential migration of contaminants beyond the Devens Reserve Forces Training Area boundary. In addition, the Army will follow the "Technical Protocol for Implementing Intrinsic Remediation with Long-Term Monitoring for Natural Attenuation of Fuel Contamination Dissolved in Groundwater," co-developed by the USEPA and the U.S. Air Force Center for Environmental Excellence, dated November 11, 1995. Key components of this alternative include:

- intrinsic bioremediation
- intrinsic bioremediation assessment data collection and groundwater modeling
- installing additional groundwater monitoring wells
- long-term groundwater monitoring
- annual data reports to USEPA and MADEP
- five-year site reviews

Each of these components is described in the following paragraphs.

Intrinsic Bioremediation. Based upon organic and inorganic speciation in the aquifer, it appears that biological degradation of the petroleum hydrocarbons is naturally occurring

at AOC 43G. Alternative 2A would allow the natural biological degradation (intrinsic bioremediation) of the CPCs to continue at the site without interruption. To assess the effectiveness of biological degradation at the site, groundwater monitoring would be performed on a scheduled basis. Additional monitoring wells would be installed.

The biological degradation of hydrocarbons is essentially an oxidation-reduction reaction in which the hydrocarbon compound is oxidized (donates electrons) and an electron acceptor, such as oxygen, is reduced (accepts electrons). Under aerobic conditions, oxygen is the electron acceptor for biological degradation activity. When oxygen is absent or depleted from a system, anaerobic conditions exist and other compounds are used as electron acceptors. Other compounds that are used as electron acceptors during anaerobic degradation of petroleum hydrocarbons include nitrate, manganese oxides, sulfate, iron, and hydrogen.

The electron acceptor that is ultimately used in the anaerobic biodegradation of hydrocarbons depends upon compound concentrations, availability, and the oxidation reduction potential of the aquifer. According to free energy laws, the order in which electron acceptors are used in anaerobic biodegradation is as follows: oxygen (aerobic conditions), nitrate, manganese oxides, ferric iron (FeIII), sulfate, and hydrogen (methanogenic conditions). As the progression of electron acceptor use occurs through this sequence, the oxidation reduction potential (ORP) of the aquifer decreases.

As defined by name, compounds that act as electron acceptors in anaerobic biodegradation gain electrons and are reduced. Typical examples of reduced forms of compounds that are produced during anaerobic biodegradation of hydrocarbons include nitrite from nitrate, manganese as Mn[II] from Mn[IV], ferrous (Fe[II]) iron from ferric ([Fe(III)]) iron, sulfide compounds from sulfate reduction, and methane from hydrogen reduction. The presence of these reduced forms of compounds in an aquifer is an indicator that biological activity is occurring. Inorganic speciation can be used to model anaerobic biological degradation.

Intrinsic bioremediation would continue at AOC 43G until the remedial action objectives are achieved. Calculations based upon degradation rates from literature indicate that contaminants would not migrate off Army property. Details of these calculations are discussed in Section 4 of the FS report. Additional data collection would be required as part of the intrinsic bioremediation assessment to confirm degradation rates, performance standards, and refine long-term groundwater monitoring needs.

Solute transport calculations were conducted for the site to provide further basis for evaluating intrinsic bioremediation (see Appendix C of the Final FS report).

Intrinsic Bioremediation Assessment Data Collection and Groundwater Modeling. Prior to installation of additional groundwater monitoring wells and refinement of a long-term groundwater monitoring plan, additional data collection and modeling is required. A work plan will be prepared detailing the proposed activities of the intrinsic bioremediation assessment, and will be submitted to the USEPA and MADEP for review prior to implementation. The additional data collection will consist of supplemental soil sampling and free product assessment in bedrock below the former gasoline USTs, additional round of groundwater sampling and analysis to refine estimates of intrinsic bioremediation effectiveness in protecting downgradient receptors. Collected data would include groundwater elevation, intrinsic bioremediation indicators, and CPC concentrations. Groundwater elevation data would supplement the existing Fort Devens water level data base for this site and would be used to refine groundwater flow direction. Intrinsic bioremediation indicator data (e.g., electron acceptor concentrations, nutrient concentrations, and ORP) will be used to verify occurring intrinsic bioremediation and determine future intrinsic bioremediation potential. Table 8 in Appendix B outlines the proposed list of analytical parameters. CPC concentration data will assist directly in estimating site-specific degradation rates and the effectiveness of intrinsic bioremediation in achieving groundwater cleanup levels. Procedures, requirements, and analytical parameters for evaluation of CPCs and TPHC (using MADEP's volatile petroleum hydrocarbon [VPH] and extractable petroleum hydrocarbon [EPH] methods), will be determined in the Intrinsic Bioremediation Assessment Work Plan. Criteria for contaminant evaluations will use risk-based concentrations, MCLs and/or MMCLs.

Data collected from the intrinsic bioremediation assessment groundwater sampling will be incorporated into fate and transport modeling. This modeling will assess the degradation and migration of the organic CPCs and refine current estimates of intrinsic bioremediation effectiveness. Initial intrinsic bioremediation modeling will be conducted as part of the alternative long-term monitoring. The existing and the new groundwater information will be examined to determine the best location for additional groundwater monitoring wells and to finalize site-specific indicator data as required for the long-term monitoring program. As additional monitoring data are collected during long-term monitoring (see Long-Term Groundwater Monitoring in this subsection), the fate and transport modeling will be updated to allow the most accurate depiction of current and

future groundwater conditions. The fate and transport model used for monitoring intrinsic bioremediation (such as Bioplume II or III) will be selected based upon the type of groundwater monitoring information gathered and market availability. Details of the model will be proposed as part of the intrinsic bioremediation assessment work plan.

Installing Additional Groundwater Monitoring Well Installation. Additional groundwater monitoring wells will be required to improve data collection coverage in the overburden and bedrock within and downgradient of the AOC. The ultimate number and location of additional groundwater monitoring wells for monitoring intrinsic bioremediation at the site will depend upon the fate and transport modeling results. These monitoring wells would be used to monitor contaminant plume location and concentration on Army property in the overburden and bedrock and to collect intrinsic biodegradation indicators. Final monitoring well locations and details will be submitted for regulatory review and concurrence.

Long-term Groundwater Monitoring. Long-term groundwater monitoring is proposed to enable assessment of the intrinsic bioremediation progress and permit detection of any potential migration of contaminants that exceed groundwater cleanup levels beyond Army property. Analytical parameters likely to be included in the monitoring program are presented in Table 8 of Appendix B. Dependent upon the results of the fate and transport modeling, groundwater monitoring would be conducted on an annual basis until three consecutive sampling rounds indicate that cleanup objectives have been met. The last two years of monitoring (confirmation) would be for only the CPCs.

Annual Data Reports. Annual reports would be submitted to USEPA and MADEP which would include a description of site activities, a summary of the long-term groundwater monitoring program results, and any modeling updates. The final detailed Long-term Groundwater Monitoring Plan shall include performance standard that will determine the effectiveness of the remedial action. The final detailed Long-Term Groundwater Monitoring Plan would be developed in conjunction with regulatory agency review and comment.

Five-year Site Reviews. Under CERCLA 121(c), any remedial action that results in contaminants remaining on site must be reviewed at least every five years. During five-year reviews, an assessment is made of whether the implemented remedy continues to be protective of human health and the environment or whether the implementation of additional remedial action is appropriate.

The five-year site review for Alternative 2A will evaluate the alternative's effectiveness at reducing potential human health risk from exposure to groundwater on-site and downgradient considering current and potential future receptors. This evaluation will be based on how successful the alternative is at attaining groundwater cleanup levels at the long-term monitoring wells.

Specific criteria for evaluating the alternative's progress and effectiveness will be established upon completion of the intrinsic bioremediation assessment data collection and groundwater modeling to permit refinement of contaminant transport and biodegradation estimates. The criteria and/or performance standard will be contained in the Long-term Monitoring Plan as developed in the remedial design/remedial action Work Plan.

If the data generated from the modeling or the long-term groundwater monitoring efforts indicate that groundwater cleanup cannot be met within 30 years, a more aggressive remedial action will take place to enhance the intrinsic bioremediation alternative.

2. AOC 43J

Alternative 2: Intrinsic Bioremediation

Intrinsic bioremediation is the principal component in Alternative 2 that is proposed to reduce contaminants on Army property at AOC 43J to below groundwater cleanup goals and also to prevent potential migration of contaminants above groundwater cleanup goals off Army property. The installation of additional monitoring wells and implementation of a long-term groundwater monitoring program will enable assessment of the biodegradation progress and permit detection of any potential migration of contaminants beyond the Army boundary. In addition, the Army will follow the "Technical Protocol for Implementing Intrinsic Remediation with Long-Term Monitoring for Natural Attenuation of Fuel Contamination Dissolved in Groundwater," co-developed by the USEPA and the U.S. Air Force Center for Environmental Excellence, dated November 11, 1995. Key components of this alternative include:

- intrinsic bioremediation
- intrinsic bioremediation assessment data collection and groundwater modeling

- installing additional groundwater monitoring wells
- long-term groundwater monitoring
- annual data reports to USEPA and MADEP
- five-year site reviews

Each of these components is described in the following paragraphs.

Intrinsic Bioremediation. A discussion of the intrinsic bioremediation process is covered in the beginning of this subsection and will not be repeated here. Based upon organic and inorganic speciation in the aquifer and other water quality parameters, it appears that degradation of the organic CPCs is occurring naturally at AOC 43J. Solute transport calculations were conducted for the site to provide further basis for evaluating intrinsic bioremediation (see Appendix D of the Final FS).

Intrinsic Bioremediation Assessment Data Collection and Groundwater Modeling. Prior to installation of additional long-term groundwater monitoring wells and refinement of a long-term groundwater monitoring plan, additional data collection and modeling is required. A work plan will be prepared detailing the proposed intrinsic bioremediation assessment activities, and will be submitted to the USEPA and MADEP for review prior to implementation. Data collection would likely consist of the installation of bedrock wells, an additional round of groundwater sampling and analysis to refine estimates of intrinsic bioremediation effectiveness in protecting downgradient receptors. Collected data would include groundwater elevation, intrinsic bioremediation indicators, and concentrations for CPCs. Groundwater elevation data would supplement the existing Fort Devens water level data base for this site and would be used to refine groundwater flow direction which appears to vary seasonally. Intrinsic bioremediation indicator data (e.g., electron acceptor concentrations, nutrient concentrations, and oxidation-reduction potential) will be used to provide additional evidence that intrinsic bioremediation is occurring and determine future intrinsic bioremediation potential. Table 9 in Appendix B outlines the proposed list of analytic parameters. CPC concentration data will assist directly in estimating site-specific degradation rates and the effectiveness of intrinsic bioremediation in achieving groundwater cleanup goals. Procedures, requirements, and analytical parameters for evaluation of CPCs and TPHC (using MADEP's VPH/EPH method), will be determined in the Intrinsic Bioremediation Assessment Work Plan.

Criteria for contaminant evaluation will use risk-based concentrations, MCLs, and/or MMCLs.

Data collected from the intrinsic bioremediation assessment groundwater sampling will be incorporated into fate and transport modeling. This modeling will assess the degradation and migration of the organic CPCs and refine current estimates of intrinsic bioremediation effectiveness. Initial intrinsic bioremediation modeling will be conducted as part of the alternative long-term monitoring phase. The existing and the new groundwater information will be examined to determine the best location for additional groundwater monitoring wells and to finalize site-specific indicator data as required for the long-term monitoring program. As additional monitoring data are collected during long-term monitoring (see Long-Term Groundwater Monitoring in this subsection), the fate and transport modeling will be updated to allow the most accurate depiction of current and future groundwater conditions. The fate and transport model used for monitoring intrinsic bioremediation (such as Bioplume II) will be selected based upon the type of groundwater monitoring information gathered and market availability. Details of the model will be proposed as part of the intrinsic bioremediation assessment work plan.

Installing Additional Groundwater Monitoring Well Installation. Additional groundwater monitoring wells will be required to improve data collection coverage within the source area and downgradient of the site. The ultimate number and location of additional long-term groundwater monitoring wells will depend upon results of the fate and transport modeling. These wells would be used to monitor contaminant plume location and concentration in relation to the Army boundary and to collect intrinsic biodegradation indicators. Final monitoring well locations and details will be submitted for regulatory review and concurrence in the Long-Term Groundwater Monitoring Plan.

Long-term Groundwater Monitoring. Long-term groundwater monitoring is proposed to enable assessment of the intrinsic bioremediation progress and permit detection of any potential migration of contaminants that exceed groundwater cleanup levels beyond Army property. Analytical parameters likely to be included in the monitoring program are presented in Table 9 in Appendix B. Dependent upon the results of the fate and transport modeling, groundwater monitoring would be conducted on an annual basis until three consecutive sampling rounds indicate that cleanup objectives have been met. It is estimated to take 27 years to achieve cleanup objectives plus two additional yearly

sampling rounds for a total of 29 years of groundwater monitoring. The last 2 years of monitoring (confirmation) would be for only the CPCs.

Annual Data Reports. Annual reports would be submitted to USEPA and MADEP which would include a description of site activities, a summary of the long-term groundwater monitoring program results, and any modeling updates. The final detailed Long-term Groundwater Monitoring Plan shall include performance standards that will determine the effectiveness of the remedial action. The final detailed Long-Term Groundwater Monitoring Plan would be developed in conjunction with regulatory agency review and comment.

Five-year Site Reviews. Under CERCLA 121(c), any remedial action that results in contaminants remaining on-site must be reviewed at least every five years. During five-year reviews, an assessment will be made of whether the implemented remedy will continue to be protective of human health and the environment, or whether the implementation of additional remedial action is appropriate.

The five-year review for Alternative 2 will evaluate the alternative's effectiveness at reducing potential human health risk from exposure to groundwater on-site and downgradient considering current and potential future receptors. This evaluation will be based on how successful the alternative is at attaining groundwater cleanup levels at the long-term monitoring wells.

Specific criteria for evaluating the alternative's progress and effectiveness will be established upon completion of the intrinsic bioremediation assessment data collection and groundwater modeling to permit refinement of contaminant transport and biodegradation estimated. The criteria and/or performance standard will be contained in the Long-term Monitoring Plan as developed in the remedial design/remedial action Work Plan.

If the data generated from the modeling or the long-term groundwater monitoring efforts indicate that groundwater cleanup cannot be met within 30 years, a more aggressive remedial action will take place to enhance the intrinsic bioremediation alternative.

XI. STATUTORY DETERMINATIONS

The selected remedy for AOC 43G and 43J groundwater, Alternative 2A and Alternative 2, respectively, is consistent with CERCLA and, to the extent practicable, the NCP. The selected remedy is protective of human health and the environment, attains ARARs, and is cost-effective. The remedy utilizes permanent solutions and alternative treatment technologies, to the maximum extent practicable for this site.

A. The Selected Remedy is Protective of Human Health and the Environment.

The alternative chosen for AOC 43G and 43J will permanently reduce the risks to human health and environment by eliminating, reducing, or controlling exposures to human and environmental receptors through engineering and institutional controls. The principal threat at AOC 43G and 43J is potential commercial/industrial use of contaminated groundwater. The reuse of these portions of Devens as part of the Reserve Forces Training Area would prevent the use of groundwater from the contaminated aquifer, resulting in reduced potential for commercial/industrial human exposure to contaminated groundwater. The continued Army maintenance activities will help ensure protection of human health and the environment by maintaining the integrity of existing pavement and ground cover.

Groundwater modeling done during the FS suggests that the groundwater contaminant plumes at each AOC will not migrate off Army property or an area located sufficiently inside the boundary in which compliance will be determined, according to cleanup criteria stated in the Record of Decision, that at minimum will meet drinking water standards. However, if at anytime during the implementation of this alternative the following occurs:

- Based on post Record of Decision fate and transport modeling, the time frame for degradation/remediation of the existing groundwater contaminant plume to groundwater cleanup levels, is determined to be longer then 30 years,

- performance standards (outlined in the Long-Term Monitoring Plan) are not achieved,

- groundwater sampling results or fate and transport modeling show the existing groundwater contaminant plume will migrate off Army property above groundwater cleanup levels, MCLs, or MMCLs,

- the five-year site review indicates that the intrinsic bioremediation alternative is not protective of human health.

The Army will evaluate an appropriate remedial action to protect human health and the environment as required under CERCLA.

B. The Selected Remedy Attains ARARs.

The selected remedy will attain all applicable or relevant and appropriate federal and State requirements. No waivers are required. ARARs for the selected remedial alternative for both AOC 43G and 43J were identified and discussed in the Final FS (Sections 2 and 5). Environmental laws from which ARARs for the selected remedial action are derived, and specific ARARs are summarized in Tables 10 through 12 in Appendix B.

C. The Selected Remedy is Cost-Effective.

In the Army's judgment, the selected remedies are cost effective (i.e., the remedies afford overall effectiveness proportional to costs). In selecting these remedies, once the Army identified alternatives that are protective of human health and the environment and that attain ARARs; the Army evaluated the overall effectiveness of each alternative according to the relevant three criteria -- long-term effectiveness and permanence; reduction in toxicity, mobility, and volume through treatment; and short-term effectiveness, in combination. The relationship of the overall effectiveness of these remedial alternatives was determined to be proportional to costs.

Review of the discussion of "Overall Protection of Human Health and the Environment" in Subsection IX.A. and of "Cost" in Subsection IX.G. suggests that each of the other alternatives assessed in each FS all provide a similar level of protectiveness. However, Alternative 2A for AOC 43G and Alternative 2 for AOC 43J, do so at the lowest cost and are considered the most cost-effective. The costs of the selected remedy, Alternative 2A for AOC 43G, in 1996 dollars are:

Estimated Time for Restoration: Approximately 12 months for engineering evaluations, design, and construction.	
Estimated Capital Cost:	$ 39,000
Estimated Operation and Maintenance Cost: (net present worth)	$406,300
Estimated Total Cost: (net present worth, assuming 5% discount rate)	$445,300

The costs of the selected remedy, Alternative 2 for AOC 43J, in 1996 dollars are:

Estimated Time for Restoration: Approximately 12 months for engineering evaluations, design, and construction.	
Estimated Capital Cost:	$ 47,200
Estimated Operation and Maintenance Cost: (net present worth)	$394,500
Estimated Total Cost: (net present worth, assuming 5% discount rate)	$441,700

D. The Selected Remedy Utilizes Permanent Solutions and Alternative Treatment or Resource Recovery Technologies to the Maximum Extent Practicable.

Once the Army identified those alternatives that attain ARARs and that are protective of human health and the environment, the Army determined which alternative made use of permanent solutions and alternative treatment technologies or resource recovery technologies to the maximum extent practicable. This determination was made by deciding which one of the identified alternatives provides the best balance of trade-offs among alternatives in terms of: (1) long-term effectiveness and permanence; (2) reduction of toxicity, mobility, and volume through treatment; (3) short-term effectiveness; (4) implementability; and (5) cost. The balancing test emphasized long-term effectiveness and permanence and the reduction of toxicity, mobility, and volume through treatment; and considered the preference for treatment as a principal element, the bias against off-site land disposal of untreated waste, and community and state acceptance. The selected remedy provides the best balance of trade-offs among the alternatives.

a. AOC 43G

Alternative 1 is considered equal to Alternative 2A when comparison is made to threshold criteria except that Alternative 1 compliance would not be able to be monitored. Alternative 1 is similar to Alternative 2A when considering primary balancing criteria except that there would be no effects to site-workers during remedy implementation or cost associated with implementation of Alternative 1. (There is no active remedial action or monitoring implemented in Alternative 1.)

Alternative 2A is similar to Alternatives 2B, 3, and 4 when considering threshold criteria, in that they all are protective of human health and are expected to meet ARARs. Alternative 2B uses SVE to minimize the potential for groundwater recontamination thereby improving the probability that intrinsic biodegradation can achieve PRGs. However, if gross contamination exists within the bedrock fractures, removal of residual soil contamination below the former gasoline USTs with SVE may not improve groundwater remediation significantly. Alternatives 3 and 4 use backup components to achieve groundwater cleanup levels if intrinsic biodegradation does not perform as anticipated. Alternative 2A would rely on additional data collection, modeling, long-term groundwater monitoring, five-year site reviews, and contingency actions (Alternative 2B) for additional action to ensure that intrinsic bioremediation is protective of human health and the environment. The added treatment technologies in Alternatives 2B, 3, and 4 can be interpreted as increasing the potential protection of downgradient receptors, although each could be added as contingency alternatives to Alternative 2A upon nonperformance of intrinsic biodegradation without jeopardizing overall protection of human health and the environment.

In general, Alternative 2A is also similar to Alternatives 2B, 3, and when 4 considering primary balancing criteria (but less expensive). Alternatives 2B, 3, and 4 more favorably offer supplemental or back-up treatment processes which contribute to the reduction of toxicity, mobility, and volume of contaminants. However, intrinsic biodegradation is likely to be the controlling factor in determining the time required for remedial action. The back-up treatment processes in Alternatives 2B, 3, and 4 would generate concentrated waste streams (sludge, filtered material, and spent carbon) that would require disposal. Because of more intrusive activities, monitoring requirements, and construction work, the potential for contaminant exposure and safety hazards to workers increases with Alternatives 2A, 2B, 3, and 4, in order presented. The engineering complexity also increases for Alternatives 2A, 2B, 3, and 4, in order presented.

Alternatives 2A through 4 all require additional data collection, modeling, or pumping tests prior to design and implementation. Alternative 2A is the least expensive alternative followed by Alternatives 2B, 3, and 4.

Alternative 3 is considered equal to Alternative 4 when considering threshold criteria, in that they both are protective of human health and will meet ARARs. Alternatives 3 and 4 use active redundant or backup treatment components to stop CPCs that exceed groundwater cleanup levels from migrating off Army property. Alternative 3 utilizes groundwater collection and treatment to intercept the more highly contaminated portion of the plume, therefore protecting human health and the environment downgradient of Army property. Alternative 4 utilizes both groundwater collection/treatment and passive aerobic bioremediation to ensure protection of human health downgradient of Army property. The added active treatment technologies in Alternative 4 can be interpreted as increasing the potential protection for downgradient receptors, although passive bioremediation could be added as a contingency alternative to Alternative 3 upon nonperformance of groundwater extraction and intrinsic biodegradation without jeopardizing overall protection of human health and the environment. Alternative 3 might also be considered equal to Alternative 4 when considering primary balancing criteria for reasons similar to those specified for Alternative 2A.

b. AOC 43J

Alternative 1 is considered equal to Alternative 2 when considering threshold criteria, except that compliance would not be able to be monitored. Alternative 1 is also considered equal to Alternative 2 when considering primary balancing criteria, except that there would be no effects to site-workers during remedial implementation or cost associated with implementation of Alternative 1. (There is no active remedial action or monitoring implemented in Alternative 1.)

Alternative 2 is considered equal to Alternatives 3, 4 and 5 when considering threshold criteria, in that they all are protective of human health and meet ARARs. Alternatives 3, 4, and 5 use redundant or backup components to achieve groundwater cleanup levels. Alternative 2 would rely on additional data collection, modeling, long-term groundwater monitoring, five-year site reviews, and contingencies for additional action to ensure that intrinsic bioremediation is protective of human health and the environment. The added treatment technologies in Alternatives 3, 4, and 5 can be interpreted as increasing the

protection of downgradient receptors, although each could also be added as contingency alternatives to Alternative 2 upon nonperformance of intrinsic biodegradation without jeopardizing overall protection of human health and the environment.

In general, Alternative 2 is also equal to or better than Alternatives 3, 4, and 5 when considering primary balancing criteria. Alternatives 3, 4 and 5 more favorably offer back-up treatment processes which contribute to the reduction of toxicity, mobility, and volume of contaminants, although intrinsic biodegradation is considered to be the controlling factor in determining the time required for remedial action. The back-up treatments in Alternatives 4 and 5 would generate concentrated waste streams (i.e., sludge, filtered material, spent carbon) that would require disposal. Also, the potential for groundwater re-contamination exists when the groundwater table rebounds after groundwater extraction has been halted for Alternatives 4 and 5. Because of more intrusive activities, monitoring requirements and construction work, the potential for contaminant exposure and safety hazards to workers increases with Alternatives 2, 3, 4 and 5, in order presented. Alternative 2 is expected to take the same number of years for remediation as Alternatives 3 and 5 (27 years) and take a shorter time than Alternative 4 (36 years). The engineering complexity increases for each alternative (i.e., Alternative 5 > Alternative 4 > Alterative 3 > Alternative 2). Alternatives 2 through 5 all require additional data collection, modeling or pilot testing prior to design and implementation. Alternatives 2 is the least expensive alternative followed by Alternatives 3, 4, and 5, in order of increasing cost.

Alternative 3 is considered equal to Alternatives 4 and 5 when comparing threshold criteria in that they all are protective of human health and meet ARARs. Alternatives 4 and 5 use active redundant or backup treatment components to achieve groundwater cleanup levels if intrinsic biodegradation does not perform as anticipated. Alternative 3 utilizes passive aerobic bioremediation to ensure protection of human health and the environment downgradient of Army property. The added active treatment technologies in Alternatives 4 and 5 can be interpreted as increasing the potential protectiveness for downgradient receptors, although each could also be added as contingency alternatives to Alternative 3 upon nonperformance of intrinsic biodegradation without jeopardizing overall protection of human health and the environment. Alternative 3 is also equal to or better than Alternatives 4 and 5 when considering primary balancing criteria for reasons similar to those specified for Alternative 2.

Alternative 4 is considered equal to Alternative 5 when considering threshold criteria, in that they are both protective of human health and meet ARARs. Alternatives 4 and 5 both use active redundant or backup treatment components to achieve groundwater cleanup levels if intrinsic biodegradation does not perform as anticipated. Alternative 5 uses an active treatment, SVE, to minimize potential groundwater re-contamination upon aquifer rebound following completion of groundwater extraction. The active treatment technology in Alternatives 5 can be interpreted as increasing the potential protectiveness for downgradient receptors. However, both alternatives require soil monitoring to assess groundwater re-contamination potential which could be difficult to perform because of the heterogenous soil medium and contaminant distribution.

Alternative 4 is also considered essentially equal to Alternatives 5 when considering primary balancing criteria. Alternative 5 more favorably uses the back-up soil treatment process, SVE, which contributes to the reduction of toxicity, mobility, and volume of contaminants within a shorter time than Alternative 4. However, additional pilot testing is required for Alternative 5. Because of more intrusive activities, monitoring requirements and construction work, the potential for contaminant exposure and safety hazards to workers is greater for Alternative 5. Also the total present worth cost is greater for Alternative 5 than for Alternative 4.

XII. DOCUMENTATION OF NO SIGNIFICANT CHANGES

The Army presented a proposed plan (preferred alternative) for remediation of groundwater contamination at AOC 43G and 43J at a public meeting held on September 5, 1996. The components of the preferred alternative (at AOC 43G, Alternative 2A: Intrinsic Bioremediation, and at AOC 43J, Alternative 2: Intrinsic Bioremediation) included:

- intrinsic bioremediation
- intrinsic bioremediation assessment data collection and groundwater modeling
- installing additional groundwater monitoring wells
- long-term groundwater monitoring

- annual data reports to USEPA and MADEP
- five-year site reviews

No changes or additions have been made to either alternative since the publication of the proposed plan.

XIII. STATE ROLE

The Commonwealth of Massachusetts has reviewed the alternatives presented in each FS and proposed plan and concurs with the selected remedy for the cleanup of the groundwater contamination at AOC 43G and 43J. The Commonwealth has also reviewed the RI and FS to determine if the selected remedy complies with applicable or relevant and appropriate laws and regulations of the Commonwealth. A copy of the declaration of concurrence is attached as Appendix E.

APPENDIX A - FIGURES

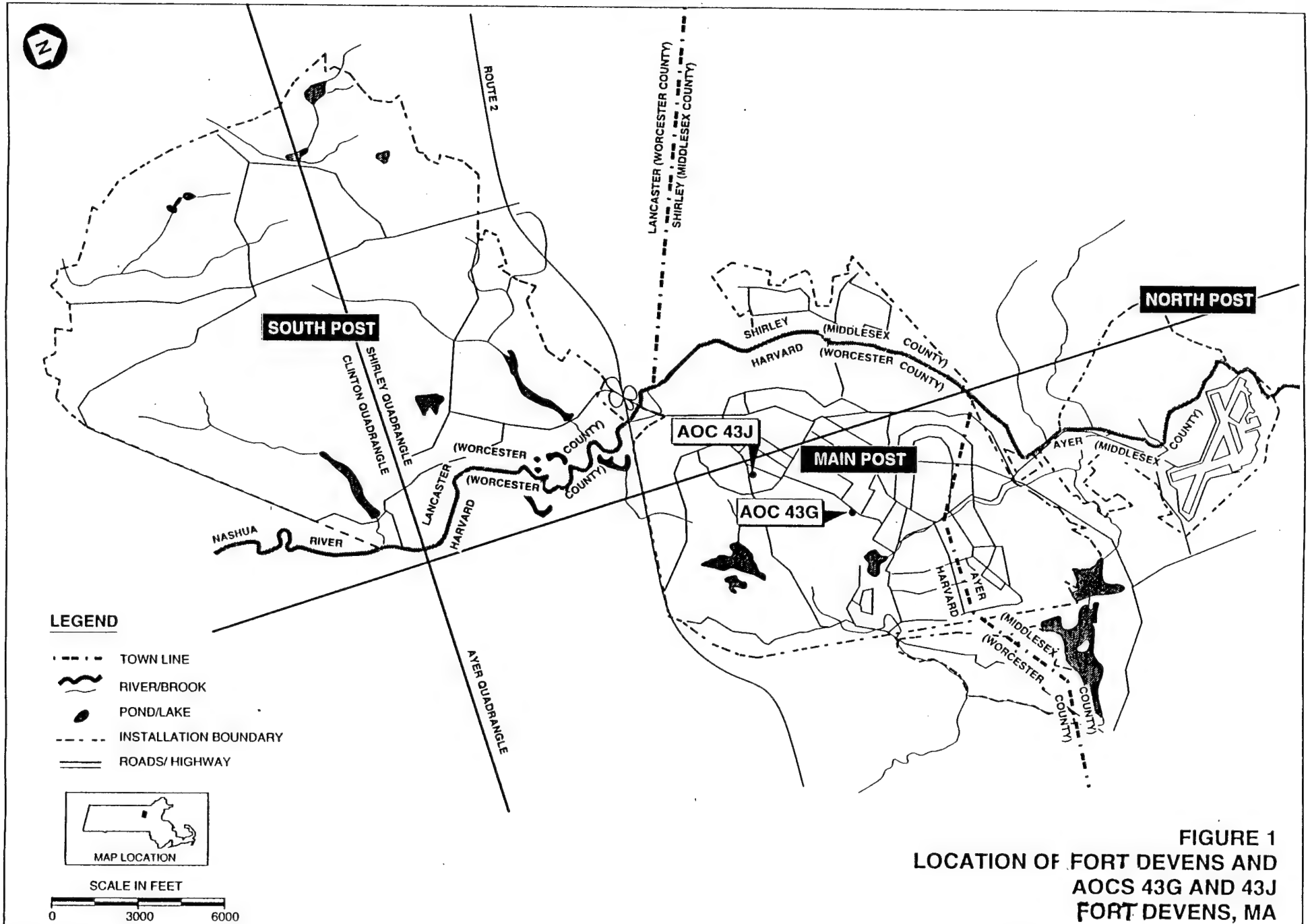


FIGURE 1
LOCATION OF FORT DEVENS AND AOCS 43G AND 43J
FORT DEVENS, MA

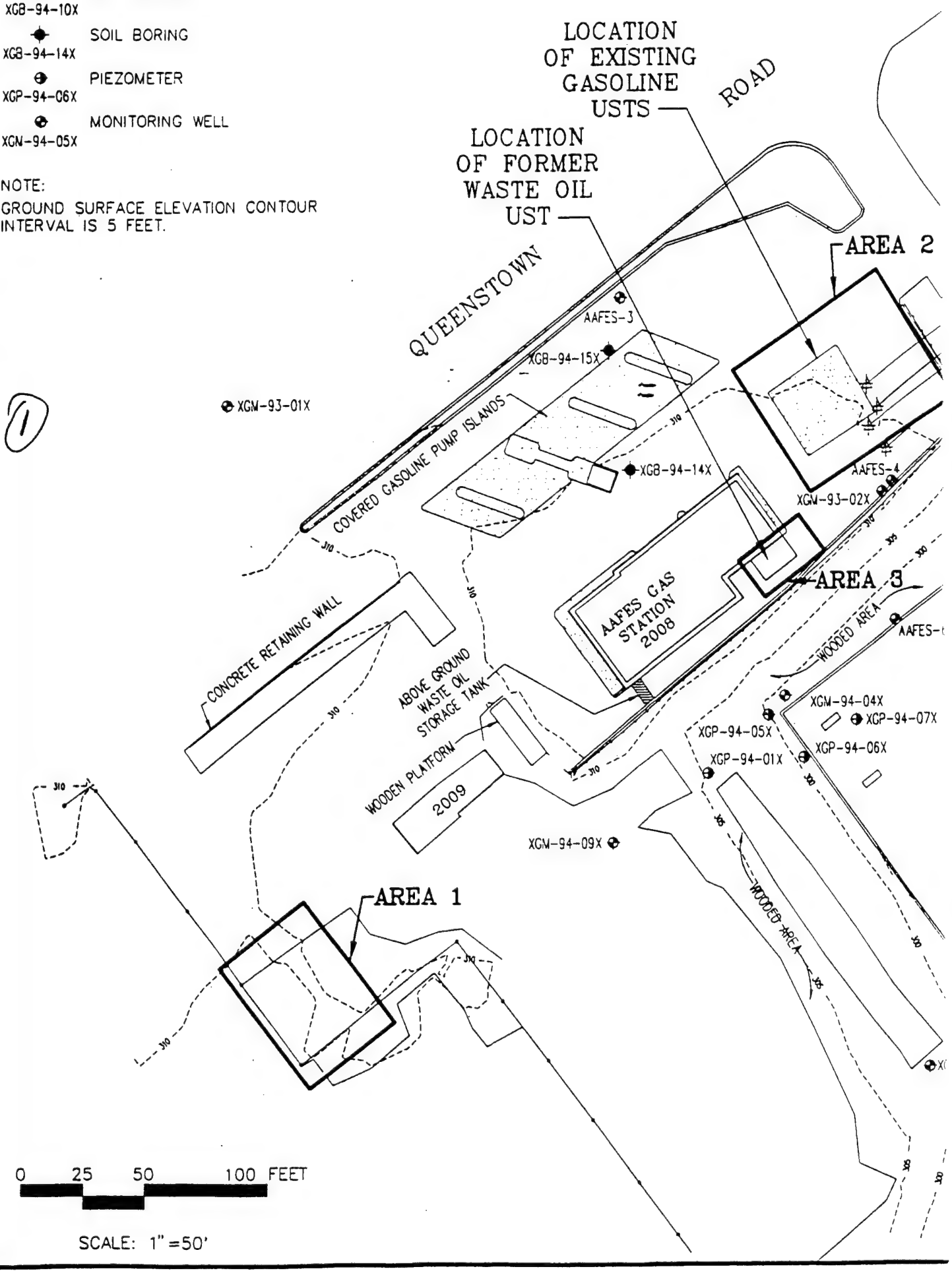
9505016D/(wa) 1

ABB Environmental Services, Inc.

LEGEND

- XGB-94-10X — SOIL BORING/VAPOR EXTRACTION WELL
- XGB-94-14X — SOIL BORING
- XGP-94-06X — PIEZOMETER
- XGM-94-05X — MONITORING WELL

NOTE:
GROUND SURFACE ELEVATION CONTOUR INTERVAL IS 5 FEET.



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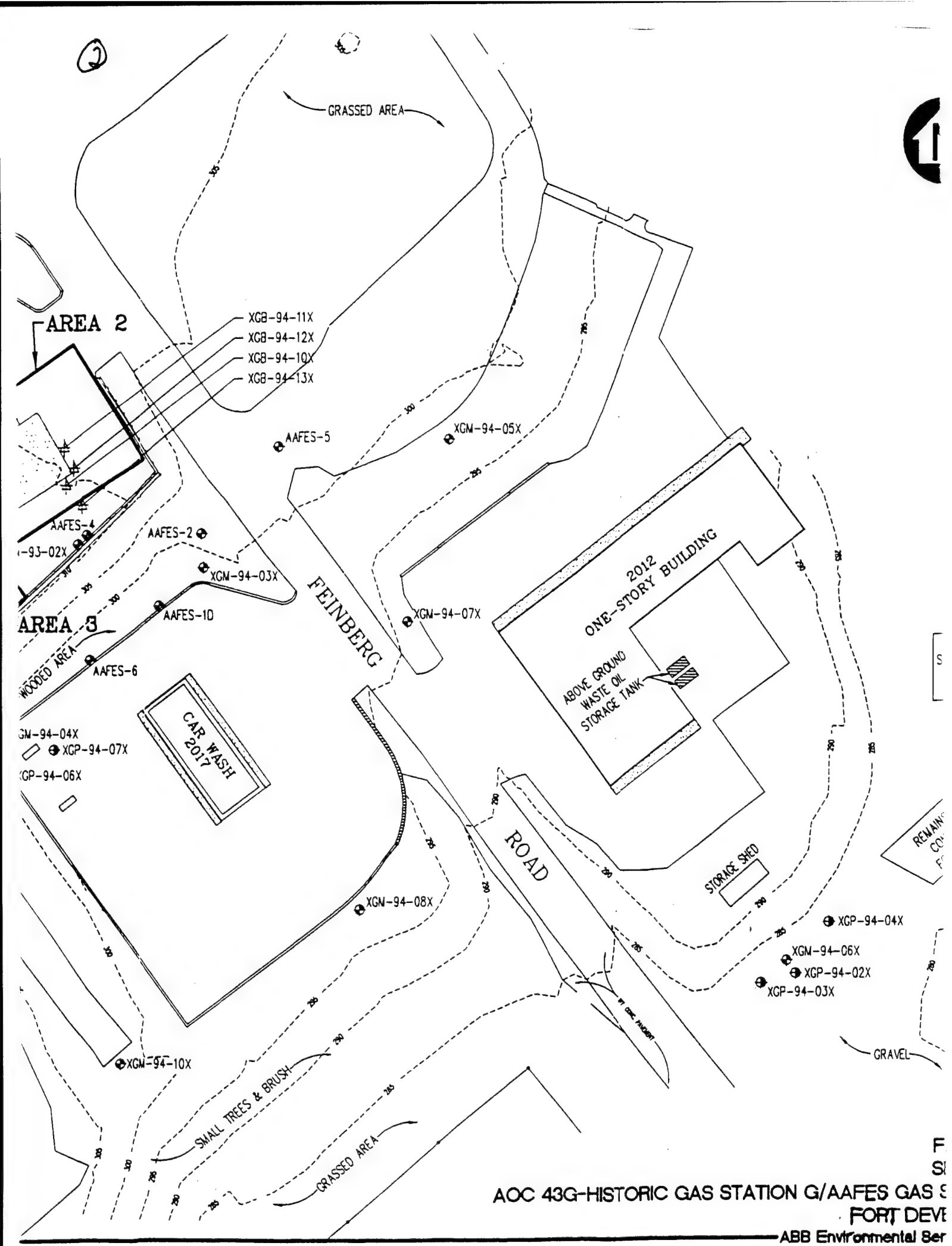


AOC 43G-HISTORIC GAS STATION G/AAFES GAS S

FORT DEVE

ABB Environmental Ser

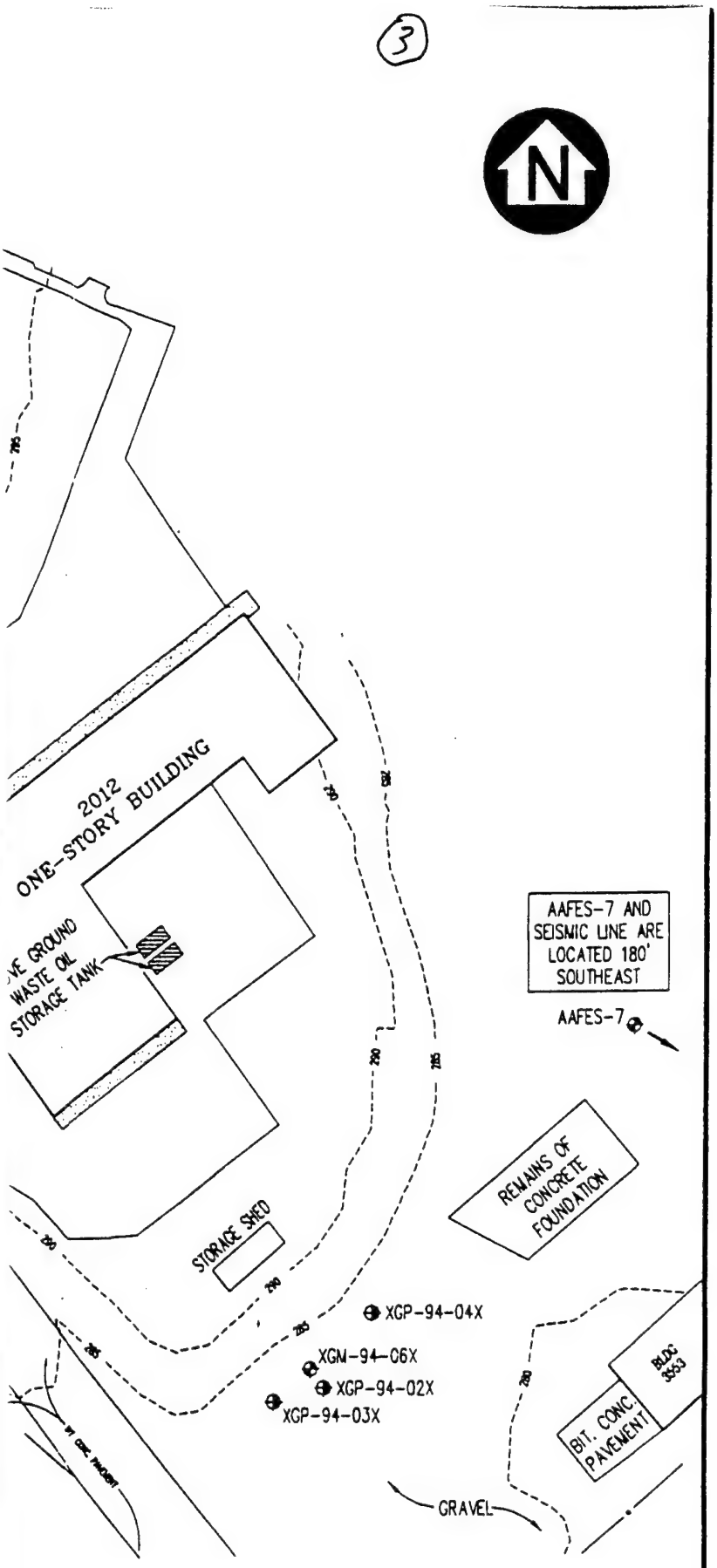
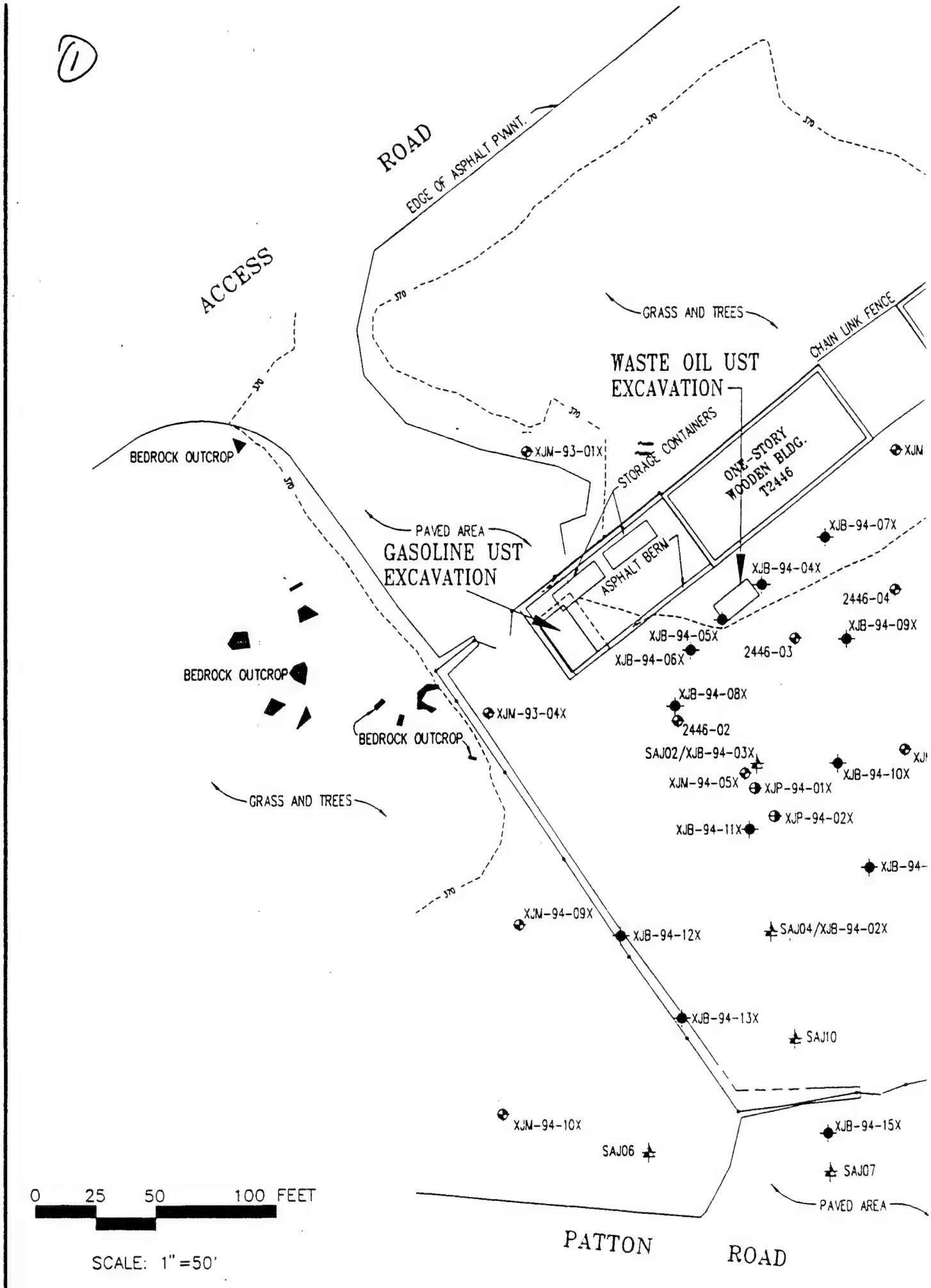
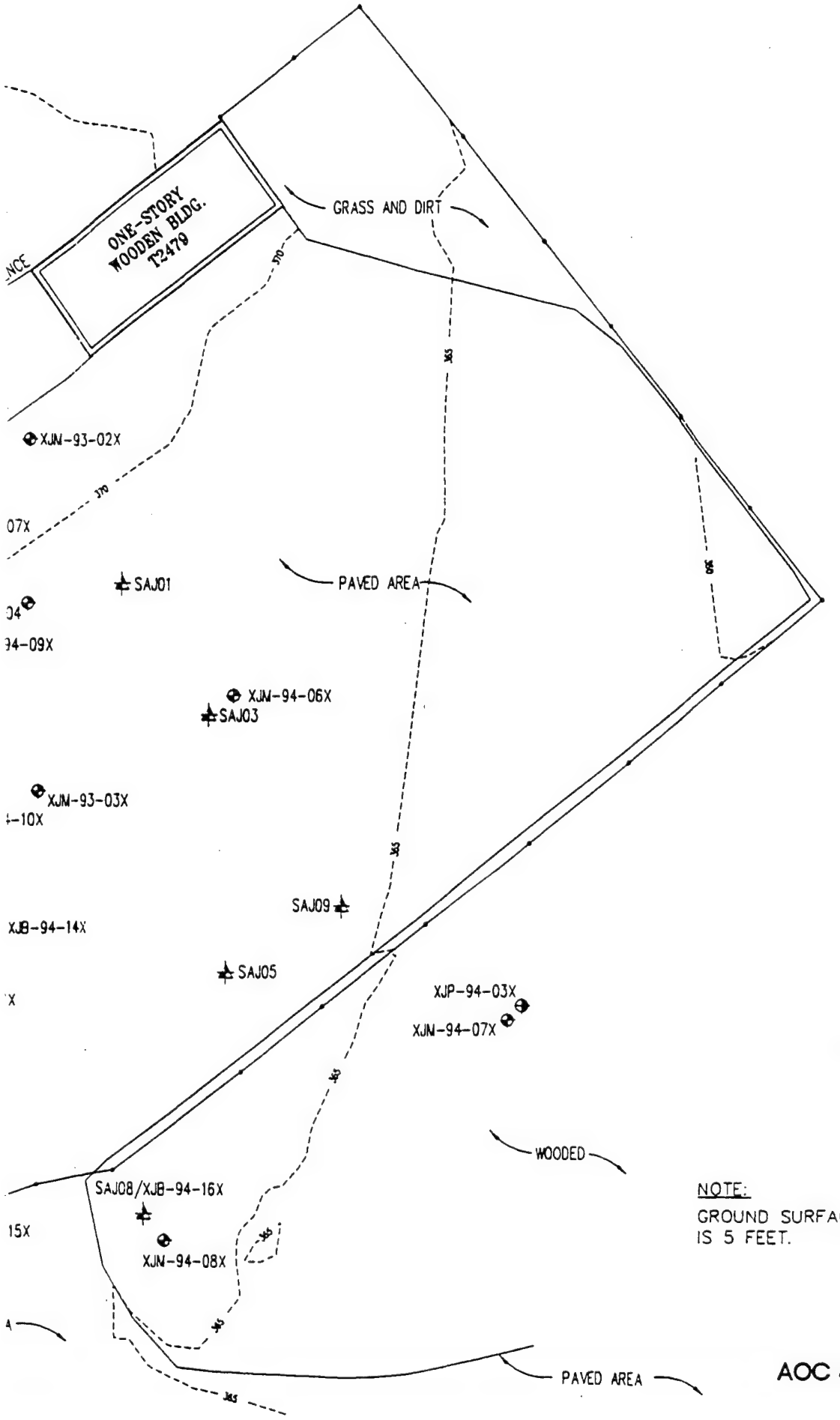


FIGURE 2
SITE MAP
-HISTORIC GAS STATION G/AAFES GAS STATION
FORT DEVENS, MA
ABB Environmental Services, Inc.


ROAD
EDGE OF ASPHALT PVMNT.
ACCESS
370
GRASS AND TREES
CHAIN LINK FENCE
WASTE OIL UST
EXCAVATION
STORAGE CONTAINERS
ONE-STORY
WOODEN BLDG.
T2446
XJM-93-01X
XJM
BEDROCK OUTCROP
PAVED AREA
GASOLINE UST
EXCAVATION
ASPHALT BERM
XJB-94-07X
XJB-94-04X
2446-04
XJB-94-09X
XJB-94-05X
XJB-94-06X
2446-03
BEDROCK OUTCROP
XJB-94-08X
XJM-93-04X
2446-02
BEDROCK OUTCROP
SAJ02/XJB-94-03X
XJB-94-10X
XJM-94-05X
XJP-94-01X
GRASS AND TREES
XJP-94-02X
XJB-94-11X
XJB-94-
XJM-94-09X
XJB-94-12X
SAJ04/XJB-94-02X
XJB-94-13X
SAJ10
XJM-94-10X
XJB-94-15X
SAJ06
SAJ07
PAVED AREA
0 25 50 100 FEET
SCALE: 1"=50'
PATTON ROAD

(2)



N

LEGEND

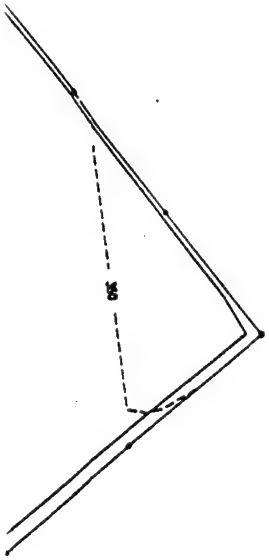
- SAJ03 — SCREENED AUGER
- XJP-94-02X — PIEZOMETER
- XJM-94-05X — MONITORING WELL
- XJB-94-05X — SOIL BORING
- CHAIN LINK FENCE WI BARBED WIRE TOP

NOTE:
GROUND SURFACE ELEVATION CONTOUR INTERVAL IS 5 FEET.

FIGURE 3
SITE MAP
AOC 43J-HISTORIC GAS STATION
FORT DEVENS, MA

ABB Environmental Services, Inc

(3)



LEGEND

- SAJ03 — SCREENED AUGER
- XJP-94-02X — PIEZOMETER
- XJM-94-05X — MONITORING WELL
- XJB-94-05X — SOIL BORING
- CHAIN LINK FENCE WITH BARBED WIRE TOP

NOTE:
GROUND SURFACE ELEVATION CONTOUR INTERVAL IS 5 FEET.

FIGURE 3
SITE MAP
AOC 43J-HISTORIC GAS STATION J
FORT DEVENS, MA

ABB Environmental Services, Inc.

APPENDIX B - TABLES

TABLE 1
SUMMARY OF SUBSURFACE STATISTICS
AOC 43G - HISTORIC GAS STATION G / AAFES GAS STATION

RECORD OF DECISION
FORT DEVENS, MA

	Range of SQLs	Frequency of Detection	Detected Concentrations Minimum	Detected Concentrations Maximum	Mean of all Samples	Back-Ground	CPC?	Notes
AREA 2 SUBSURFACE SOIL (1 - 15 feet bgs)[a] (mg/kg)								
PAL METALS								
Aluminum	N/A	5/5	3770	12200	6788	18000	No	Background[1]
Arsenic	N/A	5/5	7.15	21	12.1	19	Yes	
Barium	N/A	5/5	21.5	66.5	38.0	54	Yes	
Beryllium	0.5 - 0.5	4/5	0.964	1.38	0.9	0.81	Yes	
Calcium	N/A	5/5	651	2000	1073.6	810	No	Essential Nutrient[2]
Chromium	N/A	5/5	8.89	37.4	23.8	33	Yes	
Cobalt	1.42 - 1.42	4/5	1.67	9.94	4.9	4.7	Yes	
Copper	N/A	5/5	6.54	14.4	10.2	13.5	Yes	
Iron	N/A	5/5	9460	15300	12292	18000	No	Background[1]
Lead	N/A	5/5	3.58	50	14.1	48	Yes	Toxicity Value[3]
Magnesium	N/A	5/5	1590	5670	3488	5500	No	Essential Nutrient[2]
Manganese	N/A	5/5	81.7	324	177.8	380	No	Background[1]
Nickel	N/A	5/5	6.08	33.4	17.4	14.6	Yes	
Potassium	N/A	5/5	702	4290	2086.4	2400	No	Essential Nutrient[2]
Sodium	N/A	5/5	267	330	295.6	234	No	Essential Nutrient[2]
Vanadium	N/A	5/5	11.6	26.3	18.1	32.3	No	Background[1]
Zinc	N/A	5/5	18.2	208	63.5	43.9	Yes	
PAL SEMIVOLATILE ORGANICS								
Acenaphthylene	0.033 - 0.2	1/5	5	5	1.0	NDB	Yes	
Anthracene	0.033 - 0.2	1/5	4	4	0.8	NDB	Yes	
Benzo [a] Anthracene	0.17 - 0.8	1/5	7	7	1.5	NDB	Yes	
Benzo [a] Pyrene	0.25 - 1	1/5	10	10	2.2	NDB	Yes	
Benzo [b] Fluoranthene	0.21 - 1	1/5	30	30	6.2	NDB	Yes	
Benzo [g,h,i] Perylene	0.25 - 1	1/5	3	3	0.8	NDB	Yes	
Benzo [k] Fluoranthene	0.066 - 0.3	1/5	6	6	1.2	NDB	Yes	
Chrysene	0.12 - 0.6	1/5	10	10	2.1	NDB	Yes	
Di-n-butyl Phthalate	0.061 - 0.6	3/5	0.43	0.6	0.4	NDB	No	Blank[4]
Fluoranthene	0.068 - 0.3	1/5	20	20	4.1	NDB	Yes	
Fluorene	0.033 - 0.2	1/5	1	1	0.2	NDB	Yes	
Indeno [1,2,3-c,d] Pyrene	0.29 - 1	1/5	4	4	1.0	NDB	Yes	
Naphthalene	0.037 - 0.2	1/5	0.5	0.5	0.1	NDB	Yes	
Phenanthrene	0.033 - 0.2	1/5	10	10	2.0	NDB	Yes	
Pyrene	0.033 - 0.2	1/5	10	10	2.0	NDB	Yes	
PAL VOLATILE ORGANICS								
Acetone	0.017 - 0.017	1/5	0.047	0.047	0.02	NDB	No	Blank[4]
Trichlorofluoromethane	0.006 - 0.006	3/5	0.0057	0.01	0.01	NDB	No	Blank[4]
OTHER								
Total Petroleum Hydrocarbon	28.5 - 28.8	2/5	158	185	77.2	NDB	Yes	Toxicity Value[3]

TABLE 1
SUMMARY OF SUBSURFACE STATISTICS
AOC 43G - HISTORIC GAS STATION G / AAFES GAS STATION

RECORD OF DECISION
FORT DEVENS, MA

	Range of SQLs	Frequency of Detection	Detected Concentrations Minimum	Detected Concentrations Maximum	Mean of all Samples	Back-Ground	CPC?	Notes
AREA 3 SUBSURFACE SOIL (1 - 15 feet bgs)[b] (mg/kg)								
PAL METALS								
Aluminum	N/A	4/4	5100	11200	8835	18000	No	Background[1]
Arsenic	N/A	4/4	17	51	31.8	19	Yes	
Barium	N/A	4/4	14.6	53.3	30.2	54	No	Background[1]
Cadmium	0.7 - 0.7	1/4	2.61	2.61	0.9	1.28	Yes	
Calcium	N/A	4/4	405	1570	1026.3	810	No	Essential Nutrient[2]
Chromium	N/A	4/4	17.4	46	30.4	33	Yes	
Cobalt	1.42 - 1.42	1/4	3.56	9.93	6.4	4.7	Yes	
Copper	N/A	4/4	9.09	29.2	16.4	13.5	Yes	
Iron	N/A	4/4	9660	19300	12665	18000	Yes	
Lead	N/A	4/4	5.12	57	21.8	48	Yes	
Magnesium	N/A	4/4	2250	6100	3915.0	5500	No	Essential Nutrient[2]
Manganese	N/A	4/4	86.6	267	205.4	380	No	Background[1]
Nickel	N/A	4/4	19.5	38.3	25.2	14.6	Yes	
Potassium	N/A	4/4	568	1340	965.5	2400	No	Essential Nutrient[2]
Sodium	N/A	4/4	287	419	336	234	No	Essential Nutrient[2]
Vanadium	N/A	4/4	8.24	19.9	15.4	32.3	No	Background[1]
Zinc	N/A	4/4	21.3	87.6	42.4	43.9	Yes	
PAL SEMIVOLATILE ORGANICS								
2-Methylnaphthalene	0.049 - 0.5	1/4	0.72	0.72	0.3	NDB	Yes	
Naphthalene	0.037 - 0.4	1/4	0.46	0.46	0.2	NDB	Yes	
PAL VOLATILE ORGANICS								
Toluene	0.001 - 0.001	1/4	0.02	0.02	0.005	NDB	Yes	
Ethylbenzene	0.002 - 0.002	1/4	0.03	0.03	0.008	NDB	Yes	
Xylenes	0.002 - 0.002	1/4	0.6	0.6	0.2	NDB	Yes	
Trichlorofluoromethane	0.006 - 0.006	1/4	0.03	0.03	0.01	NDB	No	Blank[4]
OTHER								
Total Petroleum Hydrocarbons	N/A	4/4	59.2	1020	412.8	NDB	Yes	Toxicity Value[3]

TABLE 1
SUMMARY OF SUBSURFACE STATISTICS
AOC 43G - HISTORIC GAS STATION G / AAFES GAS STATION

RECORD OF DECISION
FORT DEVENS, MA

	Range of SQLs	Frequency of Detection	Detected Concentrations Minimum	Detected Concentrations Maximum	Mean of all Samples	Back-Ground	CPC?	Notes
SOURCE AREA GROUNDWATER c (mg/L) - UNFILTERED								
PAL METALS								
Aluminum	0.141 - 0.141	8/12	0.147	10.7	2.20	6.87	Yes	
Arsenic	0.003 - 0.003	11/12	0.0033	0.0577	0.01	0.0105	Yes	
Barium	NA	12/12	0.0078	0.0816	0.03	0.0396	Yes	
Calcium	NA	12/12	51.2	112	74.53	14.7	No	Essential Nutrient2
Chromium	0.006 - 0.006	3/12	0.0069	0.0292	0.007	0.0147	Yes	
Cobalt	0.025 - 0.025	2/12	0.034	0.046	0.02	0.025	Yes	
Copper	0.008 - 0.008	2/12	0.0199	0.0402	0.008	0.0081	Yes	
Iron	NA	12/12	1.46	87.2	25.89	9.1	Yes	
Lead	0.001 - 0.001	8/12	0.0017	0.0491	0.009	0.0043	Yes	
Magnesium	NA	12/12	8.84	29.6	18.9	3.48	No	Essential Nutrient2
Manganese	NA	12/12	2.88	14.3	7.6	0.291	Yes	
Nickel	0.034 - 0.034	4/12	0.0812	0.209	0.05	0.0343	Yes	
Potassium	NA	12/12	1.36	7.82	3.2	2.37	No	Essential Nutrient2
Sodium	NA	12/12	40.5	98.6	70.6	10.8	No	Essential Nutrient2
Vanadium	0.011 - 0.011	2/12	0.0122	0.0122	0.006	0.011	Yes	
Zinc	0.021 - 0.021	5/12	0.0276	0.101	0.03	0.0211	Yes	
PAL SEMIVOLATILE ORGANICS								
2,4-Dimethylphenol	0.006 - 0.06	2/12	0.016	0.021	0.01	NDB	Yes	
2-Methylnaphthalene	0.002 - 0.002	10/12	0.0021	2	0.3	NDB	Yes	
4-Methylphenol / 4-Cresol	0.001 - 0.005	1/12	0.0033	0.0033	0.0007	NDB	Yes	
Acenaphthene	0.002 - 0.02	1/12	0.0032	0.0032	0.002	NDB	Yes	
Anthracene	0.001 - 0.005	1/12	0.0014	0.0014	0.0005	NDB	Yes	
Bis (2-ethylhexyl) Phthalate	NA	12/12	0.0045	0.2	0.05	NDB	No	Blank4
Fluorene	0.004 - 0.004	2/12	0.02	0.04	0.007	NDB	Yes	
Naphthalene	0.001 - 0.001	11/12	0.0009	1	0.2	NDB	Yes	
Phenanthrene	0.001 - 0.001	3/12	0.0006	0.02	0.003	NDB	Yes	
PAL VOLATILE ORGANICS								
Xylenes	NA	12/12	0.0013	20	3.36	NDB	Yes	
Benzene	NA	12/12	0.0021	2	0.62	NDB	Yes	
Carbon Disulfide	0.001 - 0.1	1/12	0.0009	0.0009	0.01	NDB	Yes	
Ethylbenzene	NA	12/12	0.019	2	0.43	NDB	Yes	
Methylene Chloride	0.002 - 0.6	3/12	0.0027	0.02	0.04	NDB	No	Blank4
Methyl isobutyl ketone	0.003 - 0.8	1/12	0.019	0.019	0.06	NDB	No	Blank4
Toluene	0.001 - 0.001	11/12	0.0015	0.3	0.09	NDB	Yes	
SOURCE AREA GROUNDWATER c (mg/L) - FILTERED								
PAL METALS								
Aluminum	0.141 - 0.141	1/12	0.3	0.3	0.09	6.87	No	Background1
Antimony	0.003 - 0.003	2/12	0.0028	0.004	0.002	0.003	Yes	
Arsenic	NA	12/12	0.0047	0.0241	0.01	0.0105	Yes	
Barium	NA	12/12	0.0081	0.0485	0.02	0.0396	Yes	
Calcium	NA	12/12	53.1	101	72.4	14.7	No	Essential Nutrient2
Iron	NA	12/12	2.19	54.1	18.50	9.1	Yes	
Lead	0.001 - 0.001	4/12	0.0014	0.003	0.001	0.0043	No	Background1
Magnesium	NA	12/12	9.06	27.3	17.6	3.48	No	Essential Nutrient2
Manganese	NA	12/12	3.12	15.2	7.5	0.291	Yes	
Nickel	0.034 - 0.034	2/12	0.0651	0.18	0.03	0.0343	Yes	
Potassium	NA	12/12	1.41	6.66	2.7	2.37	No	Essential Nutrient2
Sodium	NA	12/12	42	105	70.9	10.8	No	Essential Nutrient2

TABLE 1
SUMMARY OF SUBSURFACE STATISTICS
AOC 43G - HISTORIC GAS STATION G / AAFES GAS STATION

RECORD OF DECISION
FORT DEVENS, MA

	Range of SQLs	Frequency of Detection	Detected Concentrations Minimum	Detected Concentrations Maximum	Mean of all Samples	Back-Ground	CPC?	Notes
DOWNGRADIENT GROUNDWATER[d] (mg/L) - UNFILTERED								
PAL METALS								
Aluminum	0.141 - 0.141	5/8	0.459	1.86	0.7	6.87	No	Background[5]
Arsenic	0.003 - 0.003	5/8	0.0107	0.0236	0.01	0.0105	Yes	
Barium	NA	8/8	0.0131	0.0276	0.02	0.0396	No	Background[5]
Calcium	NA	8/8	45.5	64.7	55.2	14.7	No	Essential Nutrient[2]
Iron	NA	8/8	0.19	12.4	5.6	9.1	Yes	
Lead	0.001 - 0.001	4/8	0.0018	0.0035	0.002	0.0043	No	Background[5]
Magnesium	NA	8/8	8.37	13.6	10.5	3.48	No	Essential Nutrient[2]
Manganese	NA	8/8	1.71	8.63	5.2	0.291	Yes	
Potassium	NA	8/8	1.48	3.79	2.6	2.37	No	Essential Nutrient[2]
Sodium	NA	8/8	40.1	104	60.6	10.8	No	Essential Nutrient[2]
Zinc	0.021 - 0.021	1/8	0.0249	0.0249	0.01	0.0211	Yes	
PAL SEMIVOLATILE ORGANICS								
2-Methylnaphthalene	0.002 - 0.002	1/8	0.0022	0.0022	0.001	NDB	Yes	
Bis (2-ethylhexyl) Phthalate	0.005 - 0.005	4/8	0.0046	0.064	0.02	NDB	No	Blank[4]
Naphthalene	0.001 - 0.001	3/8	0.003	0.0062	0.002	NDB	Yes	
PAL VOLATILE ORGANICS								
Xylenes	0.001 - 0.001	4/8	0.0018	0.047	0.01	NDB	Yes	
Benzene	0.001 - 0.001	6/8	0.0015	0.079	0.02	NDB	Yes	
Ethylbenzene	0.001 - 0.001	3/8	0.015	0.029	0.008	NDB	Yes	
Methylene Chloride	0.002 - 0.002	1/8	0.0022	0.0022	0.001	NDB	No	Blank[4]
Tetrachloroethylene	0.002 - 0.002	2/8	0.0033	0.0038	0.001	NDB	Yes	
Toluene	0.001 - 0.001	5/8	0.0005	0.0044	0.002	NDB	Yes	
DOWNGRADIENT GROUNDWATER[d] (mg/L) - FILTERED								
PAL METALS								
Arsenic	0.003 - 0.003	5/8	0.0078	0.0141	0.007	0.0105	Yes	
Barium	NA	8/8	0.0117	0.0237	0.02	0.0396	No	Background[1]
Calcium	NA	8/8	44.2	66	55.6	14.7	No	Essential Nutrient[2]
Iron	NA	8/8	0.0602	9.84	2.9	9.1	Yes	
Magnesium	NA	8/8	8.09	12.8	10.2	3.48	No	Essential Nutrient[2]
Manganese	NA	8/8	1.86	8.82	5.3	0.291	Yes	
Potassium	NA	8/8	1.44	2.91	2.3	2.37	No	Essential Nutrient[2]
Sodium	NA	8/8	39.3	110	61.6	10.8	No	Essential Nutrient[2]
Zinc	0.021 - 0.021	1/8	0.0689	0.0689	0.02	0.0211	Yes	

NOTES:
[a] Based on samples XGB-93-05X, XGB-93-06X, and XGB-93-07X
[b] Based on samples XGB-93-03X and XGB-94-04X
[c] Based on samples XGM-94-03X to -04X, XGM-93-02X, AAFES-1D, -2, -6
[d] Based on samples XGM-94-06X to -08X, -10X

Background[1] - Sample concentrations detected are below background concentrations.
Essential Nutrient[2] - Analyte is an essential human nutrient (magnesium, calcium, potassium, sodium) and is not considered a CPC.
Toxicity Value[3] - Compound cannot be evaluated quantitatively because toxicity values are not available.
Blank[4] - Compound was detected in field and/or laboratory blanks.
Background[5] - Maximum detected concentration of analyte was less than site-specific background concentrations.

SQL - Sample Quantitation Limit
NDB - not detected in background
N/A - not applicable
mg - milligram
L - liter
kg - kilogram
bgs - below ground surface
CPC - chemical of potential concern

TABLE 2
SUMMARY OF SEDIMENT STATISTICS
AOC 43G - HISTORIC GAS STATION G / AAFES GAS STATION

RECORD OF DECISION
FORT DEVENS, MA

	Frequency of Detection	Detected Concentrations [1] Minimum	Detected Concentrations [1] Maximum	Back-ground Conc.[2]	Maximum Exceeds Background?	Region III Industrial Soil Conc.[3]	MCP S-2 Soil Conc.[4]	Maximum Exceeds Guidelines?
SEMIVOLATILE ORGANIC COMPOUNDS (mg/kg)								
bis(2-Ethylhexyl)phthalate	1/2	3	3	NDB	-	410	100	No
Di-n-butylphthalate	1/2	2.6	2.6	NDB	-	200000	ND	No
Acenaphthalene	1/2	0.097	0.097	NDB	-	ND	100	No
Fluoranthene	1/2	0.28	0.28	NDB	-	82000	600	No
Phenanthrene	1/2	0.3	0.3	NDB	-	ND	100	No
Pyrene	1/2	0.39	0.39	NDB	-	61000	500	No
INORGANICS (mg/kg)								
Aluminum	2/2	3710	8370	10500	No	1E+06	ND	No
Arsenic	2/2	3.77	7.5	26	No	3.3	30	Yes[5]
Barium	2/2	17.2	32.2	26.2	Yes	140000	2500	No
Beryllium	1/2	0.621	0.621	0.5	Yes	1.3	0.8	No
Calcium	2/2	1470	1610	1100	Yes	ND	ND	-
Chromium	2/2	13.3	30.2	15.9	Yes	10000	600	No
Cobalt	2/2	2.63	4.34	7.2	No	120000	ND	No
Copper	2/2	15.3	30.1	14.3	Yes	76000	ND	No
Iron	2/2	11400	17200	7900	Yes	ND	ND	-
Lead	2/2	24	99	12.5	Yes	ND	600	No
Magnesium	2/2	1840	3280	3100	Yes	ND	ND	-
Manganese	2/2	119	237	600	No	10000	ND	No
Nickel	2/2	9.87	18.5	18.6	No	41000	700	No
Potassium	2/2	697	1430	292	Yes	ND	ND	-
Sodium	2/2	113	298	289	Yes	ND	ND	-
Vanadium	2/2	9.84	25.3	13.3	Yes	14000	2000	No
Zinc	2/2	70.7	136	55.6	Yes	610000	2500	No
OTHER (mg/kg)								
Total Petroleum Hydrocarbons	2/2	448	1200	NDB	-	ND	2500	No

1 Based on sample XGD-93-02X from the SSI and sample SSD-93-39A from the AREE 70 Report

2 Sediment background values were extracted from Appendix K of Remedial Investigations Report Functional Area II, Volume IV of IV Appendices, prepared by Ecology and Environment, Inc., (1994)

3 Industrial soil concentrations developed in USEPA Region III Risk-Based Concentration Table (USEPA, 1995b).

4 The lowest of the MCP Method I S-2/GW-1, S-2/GW-2, and S-2/GW-3 soil standards.

5 Maximum concentration exceed Region III Industrial Soil Concentration

Conc. = concentration

- = not applicable

TABLE 3
SUMMARY OF SUBSURFACE SOIL STATISTICS
AOC 43J - HISTORIC GAS STATION J

RECORD OF DECISION
FORT DEVENS, MA

	Range of SQLs	Frequency of Detection	Detected Concentrations Minimum	Detected Concentrations Maximum	Mean of all Samples	Back-Ground	CPC?	Notes
SOURCE AREA SUBSURFACE SOIL (1 - 15 feet bgs)a (mg/kg)								
PAL METALS								
Aluminum	N/A	9/9	3950	9500	7145.6	18000	No	Background1
Antimony	1.09 - 1.09	2/9	2.01	3.28	1.0	0.5	Yes	
Arsenic	N/A	9/9	9.4	20	14.1	19	Yes	
Barium	N/A	9/9	15.3	28.7	20.1	54	No	Background1
Calcium	N/A	9/9	566	1450	963.2	810	No	Essential Nutrient2
Chromium	N/A	9/9	12.9	36	18.7	33	Yes	
Cobalt	1.42 - 1.42	9/9	5.99	9.84	7.7	4.7	Yes	
Copper	N/A	9/9	14.5	169	33.3	13.5	Yes	
Iron	N/A	9/9	12900	18000	15877.8	18000	No	Background1
Lead	N/A	10/10	6.7	86	18.0	48	Yes	Toxicity Value3
Magnesium	N/A	9/9	1680	4120	3536.7	5500	No	Background1, Essential Nutrient2
Manganese	N/A	9/9	252	828	489.9	380	Yes	
Nickel	N/A	9/9	23.2	36.9	29.5	14.6	Yes	
Potassium	N/A	9/9	561	1180	769.1	2400	No	Background1, Essential Nutrient2
Sodium	N/A	9/9	366	485	431.2	234	No	Essential Nutrient2
Vanadium	N/A	9/9	6.42	20.6	10.8	32.3	No	Background1
Zinc	N/A	9/9	21.7	99	40.4	43.9	Yes	
PAL SEMIVOLATILE ORGANICS								
2-Methylnaphthalene	0.049 - 0.5	6/9	0.093	7	1.3	NDB	Yes	
bis(2-Ethylhexyl)phthalate	0.62 - 6	2/9	1	2.8	1.1	NDB	No	Blank4
Di-n-butyl Phthalate	0.061 - 0.6	1/9	1.4	1.4	0.2	NDB	No	Blank4
Naphthalene	0.037 - 0.4	5/9	0.71	10	1.5	NDB	Yes	
Phenanthrene	0.033 - 0.2	1/9	0.5	0.5	0.08	NDB	Yes	
Pyrene	0.033 - 0.2	1/9	0.7	0.7	0.1	NDB	Yes	
PAL VOLATILE ORGANICS								
Xylenes	0.0015 - 0.0015	8/10	0.0063	100	30	NDB	Yes	
Acetone	0.017 - 8	1/10	0.044	0.044	0.9	NDB	No	Blank4
Chloroform	0.0009 - 0.4	1/10	0.0081	0.0081	0.04	NDB	No	Blank4
Ethylbenzene	0.0017 - 0.0017	7/10	0.0042	30	7.8	NDB	Yes	
Toluene	0.0008 - 0.0008	5/10	0.1	20	3.6	NDB	Yes	
Trichlorofluoromethane	0.0059 - 3	1/10	0.0082	0.0082	0.3	NDB	No	Blank4
OTHER								
Total Petroleum Hydrocarbons	NA	10/10	46.2	1880	519.2	NDB	Yes	Toxicity Value3
PERIMETER AREA SUBSURFACE SOIL (1 - 15 feet bgs)b (mg/kg)								
PAL METALS								
Aluminum	N/A	15/15	2800	13900	6932	18000	No	Background1
Antimony	1.09 - 1.09	1/15	2.21	2.21	0.7	0.5	Yes	
Arsenic	N/A	15/15	8.06	31	16.9	19	Yes	
Barium	N/A	15/15	6.56	49	19.8	54	No	Background1
Beryllium	0.5 0.5	1/15	0.723	0.723	0.3	0.81	No	Background1
Cadmium	0.7 - 0.7	1/15	1.1	1.1	0.4	1.28	No	Background1
Calcium	N/A	15/15	321	3920	1022.9	810	No	Essential Nutrient2
Chromium	N/A	15/15	6.67	55.4	19.6	33	Yes	
Cobalt	1.42 - 1.42	14/15	3.83	14.8	7.5	4.7	Yes	
Copper	N/A	15/15	4.49	38.6	16.8	13.5	Yes	
Iron	N/A	15/15	3540	26000	15577.3	18000	Yes	
Lead	N/A	15/15	3.18	54	10.7	48	Yes	Toxicity Value3
Magnesium	N/A	15/15	1070	8220	3587.3	5500	No	Essential Nutrient2
Manganese	N/A	15/15	62.8	890	384.3	380	Yes	
Nickel	N/A	15/15	5.3	50.2	29.09	14.6	Yes	
Potassium	N/A	15/15	234	2940	875.7	2400	No	Essential Nutrient2
Sodium	N/A	15/15	311	452	403.1	234	No	Essential Nutrient2
Vanadium	N/A	15/15	5.14	31.4	11.4	32.3	No	Background1
Zinc	N/A	15/15	10.1	70.4	33.9	43.9	Yes	
PAL SEMIVOLATILE ORGANICS								
bis(2-Ethylhexyl)phthalate	0.62 - 3	2/15	0.76	8.1	1.0	NDB	No	Blank4
Di-n-butylphthalate	0.061 - 0.3	3/15	0.12	1.3	0.1	NDB	No	Blank4
PAL VOLATILE ORGANICS								
Acetone	0.017 - 0.017	1/15	0.062	0.062	0.01	NDB	No	Blank4
Trichlorofluoromethane	0.0059 - 0.0059	9/15	0.0057	0.018	0.008	NDB	No	Blank4
OTHER								
Total Petroleum Hydrocarbons	21.1 - 28.8	9/15	34.5	566	116.4	NDB	Yes	Toxicity Value3

TABLE 3
SUMMARY OF SUBSURFACE SOIL STATISTICS
AOC 43J - HISTORIC GAS STATION J

RECORD OF DECISION
FORT DEVENS, MA

	Range of SQLs		Frequency of Detection	Detected Concentrations Minimum	Detected Concentrations Maximum	Mean of all Samples	Back-Ground	CPC?	Notes
SOURCE AREA GROUNDWATER[c] (mg/L) - UNFILTERED									
PAL METALS									
Aluminum	0.141 -	0.141	11/12	0.285	21	5.7	6.87	Yes	
Arsenic	NA		12/12	0.00373	0.0878	0.04	0.0105	Yes	
Barium	NA		12/12	0.0087	0.119	0.1	0.0396	Yes	
Cadmium	0.004 -	0.004	1/12	0.00579	0.00579	0.002	0.00401	Yes	
Calcium	NA		12/12	40.7	87.7	54.3	14.7	No	Essential Nutrient[2]
Chromium	0.006 -	0.006	7/12	0.00886	0.0351	0.01	0.0147	Yes	
Cobalt	0.025 -	0.025	1/12	0.0306	0.0306	0.01	0.025	Yes	
Copper	0.0081 -	0.0081	5/12	0.0136	0.0325	0.01	0.00809	Yes	
Iron	NA		12/12	8.07	49.7	21.0	9.1	Yes	
Lead	0.0013 -	0.0013	12/12	0.00126	0.0267	0.008	0.00425	Yes	
Magnesium	NA		12/12	7.67	18.2	12.6	3.48	No	Essential Nutrient[2]
Manganese	NA		12/12	1.65	18.2	9.6	0.291	Yes	
Nickel	0.0343 -	0.0343	2/12	0.0577	0.0626	0.02	0.0343	Yes	
Potassium	NA		12/12	1.82	74.6	3.7	2.37	No	Essential Nutrient[2]
Sodium	NA		12/12	18.2	68.9	47.2	10.8	No	Essential Nutrient[2]
Vanadium	0.011 -	0.011	3/12	0.015	0.0276	0.009	0.011	Yes	
Zinc	0.0211 -	0.0211	6/12	0.0293	0.62	0.1	0.0211	Yes	
PAL SEMIVOLATILE ORGANICS									
1,2-Dichlorobenzene	0.0017 -	0.0017	3/12	0.0048	0.014	0.003	NDB	Yes	
1,4-Dichlorobenzene	0.0017 -	0.0017	1/12	0.0036	0.0036	0.001	NDB	Yes	
2,4-Dimethylphenol	0.0058 -	0.0058	1/12	0.0088	0.0088	0.003	NDB	Yes	
2-Methylnaphthalene	0.0017 -	0.0017	9/12	0.0062	0.1	0.03	NDB	Yes	
2-Methylphenol	0.0039 -	0.0039	2/12	0.0041	0.0053	0.002	NDB	Yes	
4-Methylphenol	0.0005 -	0.0005	4/12	0.002	0.011	0.002	NDB	Yes	
Bis(2-Ethylhexyl)phthalate	0.0048 -	0.1	9/12	0.0061	0.05	0.02	NDB	No	Blank[4]
Naphthalene	0.0005 -	0.0005	12/12	0.0041	0.3	0.1	NDB	Yes	
PAL VOLATILE ORGANICS (mg/L)									
Benzene	0.05 -	0.06	10/12	0.0015	0.3	0.10	NDB	Yes	
Ethylbenzene	0.0005 -	0.0005	10/12	0.14	3	1.3	NDB	Yes	
Toluene	NA		12/12	0.0053	7	1.5	NDB	Yes	
Xylenes	NA		12/12	0.008	8	2.6	NDB	Yes	
Carbon Tetrachloride	0.0006 -	0.08	3/12	0.02	0.1	0.02	NDB	Yes	
Chloroform	0.0005 -	0.06	5/12	0.001	0.4	0.06	NDB	Yes	
Methylene Chloride	0.0023 -	0.3	6/12	0.0034	0.7	0.1	NDB	No	Blank[4]
SOURCE AREA GROUNDWATER[c] (mg/L) - FILTERED									
PAL METALS									
Antimony	0.003 -	0.003	1/12	0.00375	0.00375	0.002	0.00303	Yes	
Arsenic	NA		12/12	0.00362	0.0726	0.03	0.0105	Yes	
Barium	NA		12/12	0.00907	0.0298	0.02	0.0396	No	Background[1]
Calcium	NA		12/12	42.4	61	53.8	14.7	No	Essential Nutrient[2]
Copper	0.0081 -	0.0081	1/12	0.0133	0.0133	0.004	0.00809	Yes	
Iron	NA		12/12	0.391	30	10.5	9.1	Yes	
Lead	0.0013 -	0.0013	5/12	0.00141	0.00618	0.002	0.00425	Yes	
Magnesium	NA		12/12	6.57	15.6	11	3.48	No	Essential Nutrient[2]
Manganese	NA		12/12	3.28	18.4	9.6	0.291	Yes	
Potassium	NA		12/12	1.48	3.38	2.5	2.37	No	Essential Nutrient[2]
Sodium	NA		12/12	20.2	67.7	48	10.8	No	Essential Nutrient[2]

TABLE 3
SUMMARY OF SUBSURFACE SOIL STATISTICS
AOC 43J - HISTORIC GAS STATION J

RECORD OF DECISION
FORT DEVENS, MA

	Range of SQLs	Frequency of Detection	Detected Concentrations Minimum	Detected Concentrations Maximum	Mean of all Samples	Back-Ground	CPC?	Notes
DOWNGRADIENT GROUNDWATERd (mg/L) - UNFILTERED								
PAL METALS								
Aluminum	0.141 - 0.141	8/8	0.171	13.9	2.5	6.87	Yes	
Arsenic	0.0025 - 0.0025	5/8	0.00277	0.0114	0.004	0.0105	Yes	
Barium	0.005 - 0.005	8/8	0.00806	0.0991	0.03	0.0396	Yes	
Calcium	NA	8/8	7.55	48.3	32.2	14.7	No	Essential Nutrient2
Chromium	0.006 - 0.006	2/8	0.0104	0.0392	0.008	0.0147	Yes	
Copper	0.0081 - 0.0081	1/8	0.015	0.015	0.005	0.00809	Yes	
Iron	NA	8/8	0.0878	22.5	4.7	9.1	Yes	
Lead	0.0013 - 0.0013	4/8	0.00184	0.0144	0.004	0.00425	Yes	
Magnesium	NA	8/8	1.11	23.7	11.5	3.48	No	Essential Nutrient2
Manganese	NA	8/8	0.0272	2.33	0.8	0.291	Yes	
Nickel	0.0343 - 0.0343	1/8	0.0559	0.0559	0.02	0.0343	Yes	
Potassium	NA	8/8	0.509	6.74	3.4	2.37	No	Essential Nutrient2
Sodium	NA	8/8	6.3	19.2	11.5	10.8	No	Essential Nutrient2
Vanadium	0.011 - 0.011	1/8	0.016	0.016	0.007	0.011	Yes	
Zinc	0.0211 - 0.0211	1/8	0.0506	0.0506	0.02	0.0211	Yes	
PAL SEMIVOLATILES								
bis(2-Ethylhexyl)phthalate	0.0048 0.0048	4/8	0.0048	0.041	0.009	NDB	No	Blank4
Naphthalene	0.0005 - 0.0005	1/8	0.0065	0.0065	0.001	NDB	Yes	
PAL VOLATILE ORGANICS								
Benzene	0.0005 - 0.0005	2/9	0.00056	0.02	0.003	NDB	Yes	
Ethylbenzene	0.0005 - 0.0005	2/8	0.00092	0.042	0.006	NDB	Yes	
Toluene	0.0005 - 0.0005	3/8	0.00073	0.042	0.006	NDB	Yes	
Xylenes	0.0008 - 0.0008	2/8	0.0018	0.089	0.01	NDB	Yes	
Carbon Tetrachloride	0.0006 - 0.0006	1/8	0.0033	0.0033	0.0007	NDB	Yes	
Chloroform	0.0005 - 0.0005	2/8	0.00086	0.0052	0.0009	NDB	Yes	
Methylene Chloride	0.0023 - 0.0023	1/8	0.0037	0.0037	0.001	NDB	No	Blank4
DOWNGRADIENT GROUNDWATERd (mg/L) - FILTERED								
PAL METALS								
Antimony	0.003 - 0.003	1/8	0.00491	0.00491	0.002	0.00303	Yes	
Arsenic	0.0025 - 0.0025	1/8	0.00373	0.00373	0.002	0.0105	No	Background1
Barium	0.005 - 0.005	6/8	0.00519	0.0219	0.01	0.0396	No	Background1
Calcium	NA	8/8	9.24	60.5	32.7	14.7	No	Essential Nutrient2
Iron	0.0388 - 0.0388	1/8	0.0483	0.0483	0.02	9.1	No	Background1
Magnesium	NA	8/8	1.49	22.6	11.2	3.48	No	Essential Nutrient2
Manganese	NA	8/8	0.00681	2.75	0.8	0.291	Yes	
Potassium	0.375 - 0.375	6/8	0.537	5.74	2.3	2.37	No	Essential Nutrient2
Sodium	NA	8/8	5.79	17.9	11.0	10.8	No	Essential Nutrient2

NOTES:

a Based on samples 43J-92-01X, XJB-94-03X, -06X, -08X, -10X, -11X, -12X

b Based on samples XJM-93-01X and -02X, XJB-94-02X, -05X, -07X, -09X, -13X through -16X

c Based on samples XJM-94-05X, XJM-93-02X, -03X, 2446-02 to -04

d Based on samples XJM-94-07X to -10X

Background1 - Sample concentrations detected are at or below background concentrations.

Essential Nutrient2 - Analyte is an essential human nutrient (magnesium, calcium, potassium, sodium) and is not considered a CPC.

Toxicity Value3 - Compound cannot be evaluated quantitatively because toxicity values are not available.

Blank4 - Compound was detected in field and/or laboratory blanks.

SQL - Sample Quantitation Limit

NDB - not detected in background

N/A - not applicable

mg - milligram

kg - kilogram

L - liter

CPC - chemical of potential concern

bgs - below ground surface

TABLE 4
GROUNDWATER CLEANUP GOALS
FOR SOURCE AREA GROUNDWATER
AOC 43G - HISTORIC GAS STATION G / AAFES GAS STATION

RECORD OF DECISION
FORT DEVENS, MA

CHEMICAL OF POTENTIAL CONCERN(7)	SOURCE AREA GROUNDWATER(4) AVERAGE EPC (µg/L) UNFILTERED	AVERAGE EPC (µg/L) FILTERED	MAXIMUM EPC (µg/L) UNFILTERED	MAXIMUM EPC (µg/L) FILTERED	UPGRADIENT GROUNDWATER(5) AVERAGE EPC (µg/L) UNFILTERED	AVERAGE EPC (µg/L) FILTERED	MAXIMUM EPC (µg/L) UNFILTERED	MAXIMUM EPC (µg/L) FILTERED	BKGRND(9) (µg/L)	SMCL (µg/L)	ARARs MCL (µg/L)	ARARs MMCL (µg/L)	PROPOSED PRG (µg/L)(8)
INORGANICS													
Arsenic	10	10	57.7	24.1	26.9	1.7	82.5	2.98	10.5	-	50	50	-(6)
Iron	25,890	18,030	87,200	54,100	16,615	ND	31,800	ND	9,100	300	-	-	9,100
Lead	9	1	49.1	3.04	21.5	ND	51.2	ND	4.25	-	15(3)	15	-(6)
Manganese	7,600	7,500	14,300	15,200	795	24	1,870	44.9	291	50	-	-	291
Nickel	50	30	209	180	63.2	ND	152	ND	34.3	-	100	100	100
VOCs													
Benzene	620	NA	2,000	NA	ND	NA	ND	NA	ND	-	5	5	5
Ethylbenzene	430	NA	2,000	NA	ND	NA	ND	NA	ND	-	700	700	700
Xylenes	3,360	NA	20,000	NA	ND	NA	ND	NA	ND	-	10,000	10,000	10,000

Notes:
(1)"Drinking Water Regulations and Health Advisories", May 1995, USEPA Office of Water
(2)"Drinking Water Standards & Guidelines for Chemicals in Massachusetts Drinking Waters", Autumn 1994, Massachusetts Department of Environmental Protection
(3)Action level
(4)Based on samples XGM-94-03X and -04X, XGM-93-02X, and AAFES-1D, -2, -6.
(5)Based on samples XGM-93-01X and AAFES-3.
(6)MCL exceedance due to high total suspended solids content or MCL exceeded in upgradient samples.
(7)Analytes that exceed primary federal or Massachusetts drinking water standards or CPCs that present cancer risks above 10(-6) or HQs above 1.0 as indentified by the baseline risk assessment in the RI report.
(8)Proposed PRGs for inorganic analytes to be measured using filtered samples.
(9)Background concentrations determined from unfiltered samples from 10 wells at select locations on base. (Samples analyzed for Total Suspended Solids ranged from <4,000 to 53,000 ug/L)
EPC = Exposure Point Concentration
ND = Not detected
NA = Not analyzed
MCL = Maximum Contaminant Level(1)
MMCL = Massachusetts Maximum Contaminant Level(2)
SMCL=Secondary MCL(1) based on aesthetics.
HQ=Hazard Quotient.

TABLE 5
GROUNDWATER CLEANUP GOALS
FOR DOWNGRADIENT AREA GROUNDWATER
AOC 43G - HISTORIC GAS STATION G / AAFES GAS STATION

RECORD OF DECISION
FORT DEVENS, MA

CHEMICAL OF POTENTIAL CONCERN(6)	DOWNGRADIENT AREA GROUNDWATER(3) AVERAGE EPC (µg/L) UNFILTERED	DOWNGRADIENT AREA GROUNDWATER(3) AVERAGE EPC (µg/L) FILTERED	DOWNGRADIENT AREA GROUNDWATER(3) MAXIMUM EPC (µg/L) UNFILTERED	DOWNGRADIENT AREA GROUNDWATER(3) MAXIMUM EPC (µg/L) FILTERED	UPGRADIENT GROUNDWATER(4) AVERAGE EPC (µg/L) UNFILTERED	UPGRADIENT GROUNDWATER(4) AVERAGE EPC (µg/L) FILTERED	UPGRADIENT GROUNDWATER(4) MAXIMUM EPC (µg/L) UNFILTERED	UPGRADIENT GROUNDWATER(4) MAXIMUM EPC (µg/L) FILTERED	BKGRND(8 (µg/L)	SMCL (µg/L)	ARARs MCL (µg/L)	ARARs MMCL (µg/L)	PROPOSED PRG (7) (µg/L)
INORGANICS													
Arsenic	10	10	23.6	14.1	26.9	1.7	82.5	2.98	10.5	-	50	50	-(5)
Manganese	5,200	5,300	8,630	8,820	795	24	1,870	44.9	291	50	-	-	291
VOCs													
Benzene	20	NA	79	NA	ND	NA	ND	NA	ND	-	5	5	5

Notes:
(1)"Drinking Water Regulations and Health Advisories", May 1995, USEPA Office of Water
(2)"Drinking Water Standards & Guidelines for Chemicals in Massachusetts Drinking Waters", Autumn 1994, Massachusetts Department of Environmental Protection
(3)Based on samples XGM-94-06X to -08X, -10X.
(4)Based on samples XGM-93-01X and AAFES-3.
(5)Detected concentrations downgradient do not exceed MCL.
(6)Analytes that exceed primary federal or Massachusetts drinking water standards or CPCs that present cancer risks above 10-6 or HQs above 1 as identified by the baseline risk assessment in the RI report.
(7)Proposed PRGs for inorganic analytes to be measured using filtered samples.
(8) Background concentrations determined from unfiltered samples from 10 wells at select locations on base. (Samples analyzed for Total Suspended Solids ranged from <4,000 to 53,000 ug/L).
EPC = Exposure Point Concentration
ND = Not detected
NA = Not analyzed
MCL = Maximum Contaminant Level(1)
HQ=Hazard Quotient
MMCL = Massachusetts Maximum Contaminant Level(2)
SMCL=Secondary MCL(1) based on aesthetics

TAB

GROUNDWATER CLEANUP GOALS
FOR SOURCE AREA GROUNDWATER
AOC 43J – HISTORIC GAS STATION J

RECORD OF DECISION
FORT DEVENS, MA

CHEMICAL OF POTENTIAL CONCERN[8]	SOURCE AREA GROUNDWATER[4] AVERAGE EPC (µg/L)		SOURCE AREA GROUNDWATER[4] MAXIMUM EPC (µg/L)		UPGRADIENT GROUNDWATER[5] AVERAGE EPC (µg/L)		UPGRADIENT GROUNDWATER[5] MAXIMUM EPC (µg/L)		BKGRND[9]	ARARs			PROPOSED PRG
	UNFILTERED	FILTERED	UNFILTERED	FILTERED	UNFILTERED	FILTERED	UNFILTERED	FILTERED	(µg/L)	SMCL (µg/L)	MCL (µg/L)	MMCL (µg/L)	(µg/L)[10]
INORGANICS													
Arsenic	40	30	87.8	72.6	11.29	ND	21.3	ND	10.5	–	50	50	50
Cadmium	2	ND	5.79	ND	ND	ND	ND	ND	4.01	–	5	5	–[6]
Iron	21,000	10,500	49,700	30,000	31,050	51.05	43,200	63.3	9,100	300	–	–	9,100
Lead	8	2	26.7	6.18	16.4	ND	24	ND	4.25	–	15[3]	15	–[7]
Manganese	9,600	9,600	18,200	18,400	1,066	67.4	1,670	107	291	50	–	–	291
VOCs													
Benzene	100	NA	300	NA	ND	NA	ND	NA	ND	–	5	5	5
Carbon Tetrachloride	20	NA	100	NA	ND	NA	ND	NA	ND	–	5	5	5
Ethylbenzene	1,300	NA	3,000	NA	ND	NA	ND	NA	ND	–	700	700	700
Toluene	1,500	NA	7,000	NA	ND	NA	ND	NA	ND	–	1,000	1,000	1,000

Notes:
[1]"Drinking Water Regulations and Health Advisories", May 1995, USEPA Office of Water
[2]"Drinking Water Standards & Guidelines for Chemicals in Massachusetts Drinking Waters", Autumn 1994, Massachusetts Department of Environmental Protection
[3]Action Level.
[4]Based on samples XJM–94–05X, XJM–93–02X, XJM–93–03X, 2446–02 to –04.
[5]Based on samples XJM–93–01X.
[6]Detected in 1 out of 12 samples. Not believed to be associated with site activities. (See Subsection 2.2.1)
[7]MCL exceedence due to high total suspended soilds. Upgradient sample also exceeds MCL.
[8]Analytes that exceed primary federal or Massachusetts drinking water standards or CPCs that present cancer risks above 10^{-6} or HQs above 1.0 as identified by the baseline risk assessment in the RI Report.
[9]Background concentrations determined from unfiltered samples from 10 wells at select locations on base. (Samples analyzed for Total Suspended Solids ranged from <4,000 to 53,000 ug/L)
[10]Proposed PRGs for inorganic analytes to be measured using filtered samples.
EPC = Exposure Point Concentration
ND = Not detected
NA = Not analyzed
MCL = Maximum Contaminant Level[1]
SMCL=Secondary MCL[1] based on aesthetics
HQ=Hazard Quotient
MMCL=Massachusetts Maximum Contaminant Level[2]

TABLE 7
GROUNDWATER CLEANUP GOALS
FOR DOWNGRADIENT AREA GROUNDWATER
AOC 43J - HISTORIC GAS STATION J

RECORD OF DECISION
FORT DEVENS, MA

CHEMICAL OF POTENTIAL CONCERN(6)	DOWNGRADIENT AREA GROUNDWATER(3)				UPGRADIENT GROUNDWATER(4)				BKGRND(9)	ARARs			PROPOSED PRG
	AVERAGE EPC (µg/L)		MAXIMUM EPC (µg/L)		AVERAGE EPC (µg/L)		MAXIMUM EPC (µg/L)			SMCL	MCL	MMCL	
	UNFILITERED	FILTERED	UNFILITERED	FILTERED	UNFILITERED	FILTERED	UNFILITERED	FILTERED	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)(7)
INORGANICS													
Arsenic	4	2	11.4	3.73	11.29	ND	21.3	ND	10.5	-	50	50	-(5,8)
Manganese	800	800	2,330	2,750	1,066	67.4	1,670	107	291	50	-	-	291
VOCs													
Benzene	3	NA	20	NA	ND	NA	ND	NA	ND	-	5	5	5
Cabron Tetrachloride	0.7	NA	3.3	NA	ND	NA	ND	NA	ND	-	5	5	-(8)

Notes:
(1)"Drinking Water Regulations and Health Advisories", May 1995, USEPA Office of Water
(2)"Drinking Water Standards & Guidelines for Chemicals in Massachusetts Drinking Waters", Autumn 1994, Massachusetts Department of Environmental Protection
(3)Based on samples XJM-94-7X to -10X.
(4)Based on samples XJM-93-01X.
(5)Unfiltered upgradient concentrations greater than downgradient concentrations.
(6)Analytes that exceed primary federal or Massachusetts drinking water standards or CPCs that present cancer risks above 10-6 or HQs above 1.0 as identified by the baseline risk assessment in the RI Report.
(7)Proposed PRGs for inorganic analytes to be measured using filtered samples.
(8)No ARAR exceeded.
(9)Background concentrations determined from unfiltered samples from 10 wells at select locations on base. (Samples analyzed for Total Suspended Solids ranged from <4,000 to 53,000 ug/L)
EPC = Exposure Point Concentration
ND = Not detected
NA = Not analyzed
MCL = Maximum Contaminant Level(1)
SMCL=Secondary MCL(1) based on aesthetics
HQ=Hazard Quotient
MMCL=Massachusetts Maximum Contaminant Level(2)

TABLE 8
INTRINSIC BIOREMEDIATION SAMPLING PARAMETERS

RECORD OF DECISION
AOC 43G
FORT DEVENS, MA

PARAMETER	PURPOSE
DISSOLVED OXYGEN	defines zone of potential aerobic activity (greater than 0.5 mg/l)
REDOX (Eh)	define/confirm type of microbiological respiration process occurring
NITRATE	electron acceptor for anaerobic microbial respiration, microbial nutrient
NITRITE	electron acceptor for anaerobic microbial respiration, microbial nutrient
PHOSPHATE	microbial nutrient
SULFATE	electron acceptor for anaerobic microbial respiration
SULFIDE	product of sulfate-based microbial respiration
TOTAL IRON	provides indication of anaerobic microbial respiration potential (compared to filtered iron)
SOLUBLE IRON [FE(II)]	product of anaerobic biodegradation (compared to unfiltered iron)
METHANE	product of carbonate-based (CO_2) microbial respiration (anaerobic degradation of carbon at redox less than -200 mV)
BENZENE, XYLENE AND ETHYLBENZENE	Compare to groundwater cleanup levels, MCLs, or MMCLs
NICKEL, IRON AND MANGANESE (filtered)	Compare to groundwater cleanup levels, MCLs, or MMCLs
TEMPERATURE	well development/purge parameter
pH	aquifer environment condition indicator
CONDUCTIVITY	well development/purge parameter
ALKALINITY	well development/purge parameter
AMMONIA-NITROGEN	microbial nutrient, preliminary form of nitrite/nitrate under aerobic conditions
TOTAL PETROLEUM HYDROCARBONS	comparison to MADEP guidelines for VPH/EPH methods
VOLATILE ORGANIC COMPOUNDS	compare to groundwater cleanup levels, MCLs, or MMCLs
SEMIVOLATILE ORGANIC COMPOUNDS	compare to groundwater cleanup levels, MCLs, or MMCLs

TABLE 9
INTRINSIC BIOREMEDIATION SAMPLING PARAMETERS
AOC 43J - HISTORIC GAS STATION J

RECORD OF DECISION
FORT DEVENS, MA

PARAMETER	PURPOSE
DISSOLVED OXYGEN	defines zone of potential aerobic activity (greater than 0.5 mg/l)
REDOX (Eh)	define/confirm type of microbiological respiration process occurring
NITRATE	electron acceptor for anaerobic microbial respiration, microbial nutrient
NITRITE	electron acceptor for anaerobic microbial respiration, microbial nutrient
PHOSPHATE	microbial nutrient
SULFATE	electron acceptor for anaerobic microbial respiration
SULFIDE	product of sulfate-based microbial respiration
TOTAL IRON	provides indication of anaerobic microbial respiration potential (compared to filtered iron)
SOLUBLE IRON [FE(II)]	product of anaerobic biodegradation (compared to unfiltered iron)
METHANE	product of carbonate-based (CO_2) microbial respiration (anaerobic degradation of carbon at redox less than -200 mV)
BENZENE, XYLENE AND ETHYLBENZENE	Compare to groundwater cleanup levels or MCLs/MMCLs
NICKEL, IRON AND MANGANESE (filtered)	Compare to groundwater cleanup levels or MCLs/MMCLs
TEMPERATURE	well development/purge parameter
pH	aquifer environment condition indicator
CONDUCTIVITY	well development/purge parameter
ALKALINITY	well development/purge parameter
AMMONIA-NITROGEN	microbial nutrient, preliminary form of nitrite/nitrate under aerobic conditions
TOTAL PETROLEUM HYDROCARBONS	comparison to MADEP guidelines for VPH/EPH methods
VOLATILE ORGANIC COMPOUNDS	comparison to groundwater cleanup levels, MCLs, or MMCLs
SEMIVOLATILE ORGANIC COMPOUNDS	comparison to groundwater cleanup levels, MCLs, or MMCLs

TABLE 10
SYNOPSIS OF FEDERAL AND STATE ARARS FOR ALTERNATIVE 2A:
INTRINSIC BIOREMEDIATION
AOC 43G - HISTORIC GAS STATION G/AAFES GAS STATION

RECORD OF DECISION
FORT DEVENS, MA

AUTHORITY	LOCATION SPECIFIC	REQUIREMENT	STATUS	REQUIREMENT SYNOPSIS	ACTION TO BE TAKEN TO ATTAIN REQUIREMENT
Federal Regulatory Authority		No location-specific ARARs will be triggered.			
State Regulatory Authority		No location-specific ARARs will be triggered.			

TABLE 10
SYNOPSIS OF FEDERAL AND STATE ARARS FOR ALTERNATIVE 2A:
INTRINSIC BIOREMEDIATION
AOC 43G - HISTORIC GAS STATION G/AAFES GAS STATION

RECORD OF DECISION
FORT DEVENS, MA

AUTHORITY	CHEMICAL SPECIFIC	REQUIREMENT	STATUS	REQUIREMENT SYNOPSIS	ACTION TO BE TAKEN TO ATTAIN REQUIREMENT
Federal Regulatory Authority	Groundwater (Also applicable as an Action Specific ARAR)	SDWA, National Primary Drinking Water Standards, MCLs [40 CFR Parts 141.11 - 141.16 and 141.50 - 141.52]	Relevant and Appropriate	The NPDWR establishes MCLs for several common organic and inorganic contaminants. MCLs specify the maximum permissible concentrations of contaminants in public drinking water supplies. MCLs are federally enforceable standards based in part on the availability and cost of treatment techniques.	Biodegradation of organic contaminants exceeding MCLs is believed to be occurring under existing conditions. MCLs will be used to evaluate the performance of this alternative through implementation of a long-term groundwater monitoring program will achieve MCLs at completion of remedy.
Federal Regulatory Authority	Groundwater	USEPA Reference Dose	TBC		
Federal Regulatory Authority	Groundwater	USEPA HAs	TBC		.

(Continued)

TABLE 10
SYNOPSIS OF FEDERAL AND STATE ARARS FOR ALTERNATIVE 2A:
INTRINSIC BIOREMEDIATION
AOC 43G - HISTORIC GAS STATION G/AAFES GAS STATION

RECORD OF DECISION
FORT DEVENS, MA

AUTHORITY	CHEMICAL SPECIFIC	REQUIREMENT	STATUS	REQUIREMENT SYNOPSIS	ACTION TO BE TAKEN TO ATTAIN REQUIREMENT
	Groundwater (Also applicable as an Action Specific ARAR)	Massachusetts Drinking Water Standards and Guidelines [310 CMR 22.0].	Relevant and Appropriate	The Massachusetts Drinking Water Standards and Guidelines list MMCLs which apply to water delivered to any user of a public water supply system as defined in 310 CMR 22.00. Private residential wells are not subject to the requirements of 310 CMR 22.00; however, the standards are often used to evaluate private residential contamination especially in CERCLA activities.	Biodegradation of organic contaminants exceeding MMCLs is believed to be occurring under existing conditions. MMCLs will be used to evaluate the performance of this alternative through implementation of a long-term groundwater monitoring program.

(continued)

TABLE 10
SYNOPSIS OF FEDERAL AND STATE ARARS FOR ALTERNATIVE 2A:
INTRINSIC BIOREMEDIATION
AOC 43G - HISTORIC GAS STATION G/AAFES GAS STATION

RECORD OF DECISION
FORT DEVENS, MA

AUTHORITY	ACTION SPECIFIC	REQUIREMENTS	STATUS	REQUIREMENT SYNOPSIS	ACTION TO BE TAKEN TO ATTAIN REQUIREMENT
Federal Regulatory Authority		RCRA Subtitle C Subpart F	Relevant and Appropriate	Groundwater protection standard.	
State Regulatory Authority	Groundwater	Massachusetts Groundwater Quality Standards [314 CMR 6.00]	Applicable	Massachusetts Groundwater Quality Standards designate and assign uses for which groundwater of the Commonwealth shall be maintained and protected and set forth water quality criteria necessary to maintain the designated uses. Groundwater at Fort Devens is classified as Class 1. Groundwater assigned to this class are fresh groundwater designated as a source of potable water supply.	Biodegradation of organic contaminants exceeding MMCLs is believed to be occurring under existing conditions. MMCLs will be used to evaluate the performance of this alternative through implementation of a long-term groundwater monitoring program.

(continued)

TABLE 10
SYNOPSIS OF FEDERAL AND STATE ARARS FOR ALTERNATIVE 2A:
INTRINSIC BIOREMEDIATION
AOC 43G - HISTORIC GAS STATION G/AAFES GAS STATION

RECORD OF DECISION
FORT DEVENS, MA

AUTHORITY	ACTION SPECIFIC	REQUIREMENTS	STATUS	REQUIREMENT SYNOPSIS	ACTION TO BE TAKEN TO ATTAIN REQUIREMENT
State Regulatory Authority	Groundwater Monitoring	Massachusetts Hazardous Waste Management Rules (MHWMR) Groundwater Protection; [310 CMR 30.660-30.679]	Relevant and Appropriate	Groundwater monitoring is required during and following remedial actions.	A long-term groundwater monitoring program is to be implemented to monitor the progress of remediation.

Notes:

CERCLA = Comprehensive Environmental Response, Compensation and Liability Act
MCLs = Maximum Contaminant Levels
MHWMR = Massachusetts Hazardous Waste Management Rules
MMCLs = Massachusetts Maximum Contaminant Levels
NPDWR = National Primary Drinking Water Standards
SDWA = Safe Drinking Water Act

TABLE 11
SYNOPSIS OF FEDERAL AND STATE ARARS FOR ALTERNATIVE 2B: INTRINSIC BIOREMEDIATION
AOC 43G - HISTORIC GAS STATION G/AAFES GAS STATION

RECORD OF DECISION
FORT DEVENS, MA

AUTHORITY	LOCATION SPECIFIC	REQUIREMENT	STATUS	REQUIREMENT SYNOPSIS	ACTION TO BE TAKEN TO ATTAIN REQUIREMENT
Federal Regulatory Authority		No location-specific ARARs will be triggered.			
State Regulatory Authority		No location-specific ARARs will be triggered.			

TABLE 11
SYNOPSIS OF FEDERAL AND STATE ARARS FOR ALTERNATIVE 2B: INTRINSIC BIOREMEDIATION
AOC 43G - HISTORIC GAS STATION G/AAFES GAS STATION

RECORD OF DECISION
FORT DEVENS, MA

AUTHORITY	CHEMICAL SPECIFIC	REQUIREMENT	STATUS	REQUIREMENT SYNOPSIS	ACTION TO BE TAKEN TO ATTAIN REQUIREMENT
Federal Regulatory Authority	Groundwater (Also applicable as an Action Specific ARAR)	SDWA, National Primary Drinking Water Standards, MCLs [40 CFR Parts 141.11 - 141.16 and 141.50 - 141.52]	Relevant and Appropriate	The NPDWR establishes MCLs for several common organic and inorganic contaminants. MCLs specify the maximum permissible concentrations of contaminants in public drinking water supplies. MCLs are federally enforceable standards based in part on the availability and cost of treatment techniques.	Biodegradation of organic contaminants exceeding MCLs is believed to be occurring under existing conditions. MCLs will be used to evaluate the performance of this alternative through implementation of a long-term groundwater monitoring program will achieve MCLs at completion of remedy.
Federal Regulatory Authority	Groundwater	USEPA Reference Dose	TBC		
Federal Regulatory Authority	Groundwater	USEPA HAs	TBC		

TABLE 11
SYNOPSIS OF FEDERAL AND STATE ARARS FOR ALTERNATIVE 2B:
INTRINSIC BIOREMEDIATION
AOC 43G - HISTORIC GAS STATION G/AAFES GAS STATION

RECORD OF DECISION
FORT DEVENS, MA

AUTHORITY	CHEMICAL SPECIFIC	REQUIREMENT	STATUS	REQUIREMENT SYNOPSIS	ACTION TO BE TAKEN TO ATTAIN REQUIREMENT
Continued	Groundwater (Also applicable as an Action Specific ARAR)	Massachusetts Drinking Water Standards and Guidelines [310 CMR 22.0].	Relevant and Appropriate	The Massachusetts Drinking Water Standards and Guidelines list MMCLs which apply to water delivered to any user of a public water supply system as defined in 310 CMR 22.00. Private residential wells are not subject to the requirements of 310 CMR 22.00; however, the standards are often used to evaluate private residential contamination especially in CERCLA activities.	Biodegradation of organic contaminants exceeding MMCLs is believed to be occurring under existing conditions. MMCLs will be used to evaluate the performance of this alternative through implementation of a long-term groundwater monitoring program.

TABLE 11
SYNOPSIS OF FEDERAL AND STATE ARARS FOR ALTERNATIVE 2B:
INTRINSIC BIOREMEDIATION
AOC 43G - HISTORIC GAS STATION G/AAFES GAS STATION

RECORD OF DECISION
FORT DEVENS, MA

AUTHORITY	ACTION SPECIFIC	REQUIREMENTS	STATUS	REQUIREMENT SYNOPSIS	ACTION TO BE TAKEN TO ATTAIN REQUIREMENT
	Disposal of treatment residues	RCRA, Land Disposal Restrictions [40 CFR 268]	Applicable	Land disposal of RCRA hazardous wastes without specified treatment is restricted. LDRs require that wastes must be treated either by a treatment technology or to a specific concentration prior to disposal in a RCRA Subtitle C permitted facility.	SVE carbon would be tested to evaluate characteristics for proper disposal/reactivation.

TABLE 11
SYNOPSIS OF FEDERAL AND STATE ARARS FOR ALTERNATIVE 2B:
INTRINSIC BIOREMEDIATION
AOC 43G - HISTORIC GAS STATION G/AAFES GAS STATION

RECORD OF DECISION
FORT DEVENS, MA

AUTHORITY	ACTION SPECIFIC	REQUIREMENTS	STATUS	REQUIREMENT SYNOPSIS	ACTION TO BE TAKEN TO ATTAIN REQUIREMENT
	Groundwater	Massachusetts Groundwater Quality Standards [314 CMR 6.00]	Applicable	Massachusetts Groundwater Quality Standards designate and assign uses for which groundwater of the Commonwealth shall be maintained and protected and set forth water quality criteria necessary to maintain the designated uses. Groundwater at Fort Devens is classified as Class 1. Groundwater assigned to this class are fresh groundwater designated as a source of potable water supply.	Biodegradation of organic contaminants exceeding MMCLs is believed to be occurring under existing conditions. MMCLs will be used to evaluate the performance of this alternative through implementation of a long-term groundwater monitoring program.
State Regulatory Authority	Groundwater Monitoring	Massachusetts Hazardous Waste Management Rules (MHWMR) Groundwater Protection; [310 CMR 30.660-30.679]	Relevant and Appropriate	Groundwater monitoring is required during and following remedial actions.	A long-term groundwater monitoring program is to be implemented to monitor the progress of remediation.

(Continued)

TABLE 11
SYNOPSIS OF FEDERAL AND STATE ARARS FOR ALTERNATIVE 2B: INTRINSIC BIOREMEDIATION
AOC 43G - HISTORIC GAS STATION G/AAFES GAS STATION

RECORD OF DECISION
FORT DEVENS, MA

AUTHORITY	ACTION SPECIFIC	REQUIREMENTS	STATUS	REQUIREMENT SYNOPSIS	ACTION TO BE TAKEN TO ATTAIN REQUIREMENT
Continued	SVE Treatment	Massachusetts Air Pollution Control Regulations [310 CMR 6.00 - 7.00]	Applicable	SVE system must reduce VOCs in air effluent stream by at least 95% by weight.	Emissions will be managed through engineering controls.

Notes:

CERCLA = Comprehensive Environmental Response, Compensation and Liability Act
MCLs = Maximum Contaminant Levels
MHWMR = Massachusetts Hazardous Waste Management Rules
MMCLs = Massachusetts Maximum Contaminant Levels
NPDWR = National Primary Drinking Water Standards
SDWA = Safe Drinking Water Act

TABLE 12
SYNOPSIS OF FEDERAL AND STATE ARARS FOR ALTERNATIVE 2:
INTRINSIC BIOREMEDIATION
AOC 43J - HISTORIC GAS STATION J

RECORD OF DECISION
FORT DEVENS, MA

AUTHORITY	LOCATION SPECIFIC	REQUIREMENT	STATUS	REQUIREMENT SYNOPSIS	ACTION TO BE TAKEN TO ATTAIN REQUIREMENT
Federal Regulatory Authority		No location-specific ARARs will be triggered.			
State Regulatory Authority		No location-specific ARARs will be triggered.			

TABLE 12
SYNOPSIS OF FEDERAL AND STATE ARARS FOR ALTERNATIVE 2:
INTRINSIC BIOREMEDIATION
AOC 43J - HISTORIC GAS STATION J

RECORD OF DECISION
FORT DEVENS, MA

AUTHORITY	CHEMICAL SPECIFIC	REQUIREMENT	STATUS	REQUIREMENT SYNOPSIS	ACTION TO BE TAKEN TO ATTAIN REQUIREMENT
Federal Regulatory Authority	Groundwater (Also applicable as an Action Specific ARAR)	SDWA, National Primary Drinking Water Standards, MCLs [40 CFR Parts 141.11 - 141.16 and 141.50 - 141.52]	Relevant and Appropriate	The NPDWR establishes MCLs for several common organic and inorganic contaminants. MCLs specify the maximum permissible concentrations of contaminants in public drinking water supplies. MCLs are federally enforceable standards based in part on the availability and cost of treatment techniques.	Biodegradation of organic contaminants exceeding MCLs is believed to be occurring under existing conditions. MCLs will be used to evaluate the performance of this alternative through implementation of a long-term groundwater monitoring program will achieve MCLs at completion of remedy.
Federal Regulatory Authority	Groundwater	USEPA Reference Dose	TBC		
Federal Regulatory Authority	Groundwater	USEPA HAs/TBC	TBC		

(c[redacted]ed)

TABLE 12
SYNOPSIS OF FEDERAL AND STATE ARARS FOR ALTERNATIVE 2:
INTRINSIC BIOREMEDIATION
AOC 43J - HISTORIC GAS STATION J

RECORD OF DECISION
FORT DEVENS, MA

AUTHORITY	CHEMICAL SPECIFIC	REQUIREMENT	STATUS	REQUIREMENT SYNOPSIS	ACTION TO BE TAKEN TO ATTAIN REQUIREMENT
State Regulatory Authority	Groundwater (Also applicable as an Action Specific ARAR)	Massachusetts Drinking Water Standards and Guidelines [310 CMR 22.0].	Relevant and Appropriate	The Massachusetts Drinking Water Standards and Guidelines list MMCLs which apply to water delivered to any user of a public water supply system as defined in 310 CMR 22.00. Private residential wells are not subject to the requirements of 310 CMR 22.00; however, the standards are often used to evaluate private residential contamination especially in CERCLA activities.	Biodegradation of organic contaminants exceeding MMCLs is believed to be occurring under existing conditions. MMCLs will be used to evaluate the performance of this alternative through implementation of a long-term groundwater monitoring program.

(continued)

TABLE 12
SYNOPSIS OF FEDERAL AND STATE ARARS FOR ALTERNATIVE 2:
INTRINSIC BIOREMEDIATION
AOC 43J - HISTORIC GAS STATION J

RECORD OF DECISION
FORT DEVENS, MA

AUTHORITY	ACTION SPECIFIC	REQUIREMENTS	STATUS	REQUIREMENT SYNOPSIS	ACTION TO BE TAKEN TO ATTAIN REQUIREMENT
Federal Regulatory Authority		RCRA Subtitle C Subpart F	Relevant and Appropriate	Groundwater protection standards.	
	Groundwater	Massachusetts Groundwater Quality Standards [314 CMR 6.00]	Applicable	Massachusetts Groundwater Quality Standards designate and assign uses for which groundwater of the Commonwealth shall be maintained and protected and set forth water quality criteria necessary to maintain the designated uses. Groundwater at Fort Devens is classified as Class 1. Groundwater assigned to this class are fresh groundwater designated as a source of potable water supply.	Biodegradation of organic contaminants exceeding MMCLs is believed to be occurring under existing conditions. MMCLs will be used to evaluate the performance of this alternative through implementation of a long-term groundwater monitoring program.

(continued)

TABLE 12
SYNOPSIS OF FEDERAL AND STATE ARARS FOR ALTERNATIVE 2:
INTRINSIC BIOREMEDIATION
AOC 43J - HISTORIC GAS STATION J

RECORD OF DECISION
FORT DEVENS, MA

AUTHORITY	ACTION SPECIFIC	REQUIREMENTS	STATUS	REQUIREMENT SYNOPSIS	ACTION TO BE TAKEN TO ATTAIN REQUIREMENT
State Regulatory Authority	Groundwater Monitoring	Massachusetts Hazardous Waste Management Rules (MHWMR) Groundwater Protection; [310 CMR 30.660-30.679]	Relevant and Appropriate	Groundwater monitoring is required during and following remedial actions.	A long-term groundwater monitoring program is to be implemented to monitor the progress of remediation.

Notes:

CERCLA = Comprehensive Environmental Response, Compensation and Liability Act
MCLs = Maximum Contaminant Levels
MHWMR = Massachusetts Hazardous Waste Management Rules
MMCLs = Massachusetts Maximum Contaminant Levels
NPDWR = National Primary Drinking Water Standards
SDWA = Safe Drinking Water Act

APPENDIX C - RESPONSIVENESS SUMMARY

This Responsiveness Summary has been prepared to meet the requirements of Sections 113(k)(2)(B)(iv) and 117(b) of the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA) as amended by the Superfund Amendments and Reauthorization Act of 1986 (SARA), which requires response to "... significant comments, criticisms, and new data submitted in written or oral presentations" on a proposed plan for remedial action. The purpose of this Responsiveness Summary is to document Army responses to questions and comments expressed during the public comment period by the public, potentially responsible parties, and governmental bodies in written and oral comments regarding the proposed plan for the groundwater cleanup at Area of Contamination (AOCs) 43G and 43J.

The Army held a 30-day public comment period from August 26 to September 25, 1996 to provide an opportunity for interested parties to comment on the Feasibility Study (FS), proposed plan, and other documents developed to address the cleanup of contaminated groundwater at AOC 43G and 43J at Devens, Massachusetts. The FS developed and evaluated various options (referred to as remedial alternatives) to address human health from exposure to contaminated groundwater and potential migration of substances present in groundwater at both AOC 43G and 43J. The Army identified its preferred alternative for cleanup of groundwater in the proposed plan issued on August 25, 1996.

All documents on which the preferred alternative were based were placed in the Administrative Record for review. The Administrative Record contains all supporting documentation considered by the Army in choosing the remedy for both AOC 43G and 43J. The Administrative Record is available to the public at the Devens Base Realignment and Closure (BRAC) Environmental Office, Building P-12, Devens, and at the Ayer Town Hall, Main Street, Ayer. An index to the Administrative Record is available at the U.S. Environmental Protection Agency (USEPA) Records Center, 90 Canal Street, Boston, Massachusetts and is provided as Appendix D to the Record of Decision.

This Responsiveness Summary is organized into the following sections:

I. Overview of Remedial Alternatives Considered in the FS Including the Selected Remedy-This section briefly outlines the remedial alternatives evaluated in detail in the FS and presented in the proposed plan, including the Army's selected remedies.

II. Background on Community Involvement-This section provides a brief history of community involvement and Army initiatives in informing the community of site activities.

III. Summary of Comments Received During the Public Comment Period and Army Responses-This section provides Army responses to oral and written comments received from the public and not formally responded to during the public comment period. A transcript of the public meeting consisting of all comments received during this meeting and the Army's responses to these comments is provided in Attachment A of this Responsiveness Summary.

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I. OVERVIEW OF REMEDIAL ALTERNATIVES CONSIDERED IN THE FS INCLUDING THE SELECTED REMEDY

Five remedial alternatives were developed in the AOC 43G and 43J FS reports and screened based on implementability, effectiveness, and cost to narrow the number of remedial alternatives for detailed analysis. All five alternatives were retained in each FS for detailed evaluation. The five retained alternatives are:

AOC 43G

A. Alternative 1: No Action

The No Action alternative serves as a baseline alternative with which to compare other remedial alternatives for AOC 43G. The No Action alternative does not contain any additional remedial action components to reduce or control potential risks. Existing activities to maintain existing systems and monitor for potential contaminant migration would be discontinued.

B. Alternative 2A: Intrinsic Bioremediation

Intrinsic bioremediation is the principal component in Alternative 2A that is proposed to prevent chemicals of potential concern (CPCs) that exceed groundwater cleanup levels from potentially migrating off the Army property and to reduce contaminants on Army

property to below groundwater cleanup goals. The installation of additional monitoring wells and implementation of a long-term groundwater monitoring program will enable assessment of the biodegradation progress and permit detection of any potential migration of contaminants beyond the Devens Reserve Forces Training Area boundary. Key components of this alternative include:

- intrinsic bioremediation
- intrinsic bioremediation assessment data collection and groundwater modeling
- installing additional groundwater monitoring wells
- long-term groundwater monitoring
- annual data reports to U.S. Environmental Protection Army (USEPA) and Massachusetts Department of Environmental Protection (MADEP)
- five-year site reviews

The Army's selected remedy is Alternative 2A.

C. Alternative 2B: Intrinsic Bioremediation/Soil Venting of Gasoline UST Soils

Like Alternative 2A, intrinsic bioremediation is the principal component in Alternative 2B that is proposed to prevent CPCs that exceed groundwater cleanup levels from potentially migrating off the Army property and to reduce on- site contaminants to below groundwater cleanup goals. However, Alternative 2B also includes installation of an SVE system to reduce residual contaminant concentrations in soils below the former gasoline underground storage tanks (USTs) (now adjacent and below the existing gasoline USTs). The objective of the soil vapor extraction (SVE) system is to remediate the vadose zone soils below the former gasoline UST, to prevent further potential contamination of the aquifer. The soils that contain volatile organic compounds (VOCs) may contribute to groundwater contamination during periods of high water table conditions. Minimizing the potential re-contamination of groundwater will improve the effectiveness of intrinsic bioremediation. The following specific actions are included in Alternative 2B:

- intrinsic bioremediation
- intrinsic bioremediation assessment data collection / groundwater modeling
- installing additional groundwater monitoring wells

- SVE treatment system installation and operation
- Soil vapor monitoring
- long-term groundwater monitoring
- annual data reports to USEPA and MADEP
- five-year site reviews

D. Alternative 3: Groundwater Collection and Treatment/Intrinsic Bioremediation

Alternative 3 for AOC 43G is designed to reduce potential future human health risks by using groundwater extraction to hydraulically intercept and to treat the contaminant plume immediately downgradient of the source areas. Intrinsic bioremediation would be used to degrade CPCs below groundwater cleanup levels farther downgradient or to minimize the potential for further migration of the plume. This alternative is similar to Alternative 2A except the plume near the source would be intercepted hydraulically rather than relying on intrinsic bioremediation to treat the plume near the source area. Based on the continual source simulation of the solute transport model, more then 30 years is expected to be required to remove all the contamination in the aquifer using pumping remediation and intrinsic bioremediation. Extraction wells would be positioned within the higher contaminated portion of the plume and spaced to intercept the plume from the source area. The following specific actions are included in Alternative 3:

- intrinsic bioremediation
- intrinsic bioremediation data collection and design
- groundwater treatment facility construction
- groundwater treatment facility operation and maintenance
- installing additional groundwater monitoring wells
- long-term groundwater monitoring
- annual data reports to USEPA and MADEP
- five-year site reviews

E. Alternative 4: Intrinsic Bioremediation/Hydraulic Containment

Alternative 4 for AOC 43G is designed to reduce potential future human health risks. In addition to the components of Alternative 3, this alternative provides installation of

passive in-situ bioremediation wells to reduce potential future risk to downgradient receptors from potentially contaminated groundwater. The following specific actions are included in Alternative 4:

- intrinsic bioremediation
- installing passive in-situ bioremediation wells
- passive in-situ bioremediation system maintenance
- intrinsic bioremediation assessment data collection and design
- groundwater treatment facility construction
- groundwater treatment facility operation and maintenance
- installing additional groundwater monitoring wells
- long-term groundwater monitoring
- annual data reports to USEPA and MADEP
- five-year site reviews

AOC 43J

A. Alternative 1: No Action

The No Action alternative serves as a baseline alternative with which to compare other remedial alternatives for AOC 43J. The No Action alternative does not contain any additional remedial action components to reduce or control potential risks. Existing activities to maintain existing systems and monitor for potential contaminant migration would be discontinued.

B. Alternative 2: Intrinsic Bioremediation

Intrinsic bioremediation is the principal component in Alternative 2 that is proposed to reduce contaminants on Army Reserve Enclave property to below PRGs and also to prevent potential migration of contaminants above PRGs off Army Reserve Enclave property. The installation of additional monitoring wells and implementation of a long-term groundwater monitoring program will enable assessment of the biodegradation progress and permit detection of any potential migration of contaminants beyond the Army Reserve Enclave boundary. Key components of this alternative include:

- intrinsic bioremediation

- intrinsic bioremediation assessment data collection and groundwater modeling
- installing additional groundwater monitoring wells
- long-term groundwater monitoring
- annual data reports to USEPA and MADEP
- five-year site reviews

C. Alternative 3: Intrinsic Bioremediation / Passive In-Situ Bioremedial Containment

Alternative 3 for AOC 43J is designed to reduce potential future human health risks. In addition to the components of Alternative 2, this alternative provides installation of passive bioremediation wells to reduce potential future risk to downgradient receptors from potentially contaminated groundwater. The following specific actions are included in Alternative 3:

- intrinsic bioremediation
- installing passive bioremediation wells
- passive in-situ bioremediation system maintenance
- intrinsic bioremediation assessment data collection and groundwater modeling
- installing additional groundwater monitoring wells
- long-term groundwater monitoring
- annual data reports to USEPA and MADEP
- five-year site reviews

D. Alternative 4: Intrinsic Bioremediation / Hydraulic Containment

Alternative 4 for AOC 43J is designed to reduce potential future human health risks by using intrinsic bioremediation to degrade CPCs below groundwater cleanup levels on site and using groundwater extraction and treatment to hydraulically contain and also to treat the contaminant plume. This alternative is similar to Alternative 3 except the plume would be contained hydraulically rather than by aerobic biodegradation to reduce potential future risk to downgradient receptors. Calculations based on site soil and contaminant characteristics reveal that up to 56 years may be required to remove all the contamination in the aquifer using pumping remediation alone (no abiotic removal or biological degradation effects). Intrinsic bioremediation is expected to reduce CPCs to

below groundwater cleanup levels in less time as will be detailed below. Therefore, the groundwater extraction and treatment component in this alternative serves more for hydraulic containment of the contaminant plume while reduction of contaminant concentrations would be shared both by intrinsic bioremediation and groundwater extraction. Extraction wells would be positioned within the higher contaminated portion of the plume to maximize treatment efficiency for this alternative. The following specific actions are included in Alternative 4:

- intrinsic bioremediation
- intrinsic bioremediation assessment data collection and design
- groundwater treatment facility construction
- groundwater treatment facility operation and maintenance
- installing additional groundwater monitoring wells
- long-term groundwater and soil monitoring
- annual data reports to USEPA and MADEP
- five-year site reviews

E. Alternative 5: Groundwater Collection and Treatment / Soil Treatment

Alternative 5 involves installation of a groundwater extraction and treatment system as detailed in Alternative 4. As previously discussed in Alternative 4, residual contamination may be left on the soil above the water table when the groundwater in the plume area is lowered during groundwater extraction. Alternative 4 includes installation of a SVE system to remediate contaminated soils which will be left above the lowered groundwater table. The objectives of groundwater extraction and treatment are a) to halt/minimize the migration of the contamination plume (hydraulic control) and b) to remediate the aquifer. The objective of soil venting is to remediate the vadose zone and to prevent recontamination of the groundwater upon rebounding of the aquifer. The combination of groundwater extraction and treatment, SVE, and intrinsic bioremediation will minimize the potential of off-site migration of groundwater CPCs and remediate site soil and groundwater. The following specific actions are included in Alternative 5:

- intrinsic bioremediation assessment data collection and design
- SVE treatment system installation
- groundwater treatment facility construction
- installing additional groundwater monitoring wells
- groundwater treatment facility operation and maintenance

- soil monitoring
- long-term groundwater monitoring
- annual data reports to USEPA and MADEP
- five-year site reviews
- intrinsic bioremediation

II. BACKGROUND ON COMMUNITY INVOLVEMENT

Community concern and involvement have been low throughout the history of the AOC 43G and 43J investigations. Although the Army has kept the community and other interested parties informed of site activities through regular and frequent informational meetings, press releases, and a public meeting, no members of the public attended the public meeting on the proposed plan.

In February 1992, the Army released, following public review, a community relations plan that outlined a program to address community concerns and keep citizens informed about and involved in remedial activities at Fort Devens. As part of this plan, the Army established a Technical Review Committee (TRC) in early 1992. The TRC, as required by SARA Section 211 and Army Regulation 200-1, included representatives from USEPA, U.S. Army Environmental Center (USAEC), Fort Devens, MADEP, local officials and the community. Until January 1994, when it was replaced by the Restoration Advisory Board (RAB), the committee generally met quarterly to review and provide technical comments on schedules, work plans, work products, and proposed activities for the Study Areas at Devens. The Remedial Investigation (RI), and FS reports, proposed plan, and other related support documents were all submitted to the TRC or RAB for their review and comment.

The Army, as part of its commitment to involve the affected communities, forms a RAB when an installation closure involves transfer of property to the community. The Fort Devens RAB was formed in February 1994 to add members of the Citizen's Advisory Committee (CAC) to the TRC. The CAC had been established previously to address Massachusetts Environmental Policy Act/Environmental Assessment issues concerning the reuse of property at Fort Devens. The RAB consists of 28 members (15 original TRC members plus 13 new members) who are representatives from the Army, USEPA Region I, MADEP, local governments and citizens of the local communities. It meets monthly and provides advice to the installation and regulatory agencies on Devens

cleanup programs. Specific responsibilities include: addressing cleanup issues such as land use and cleanup goals; reviewing plans and documents; identifying proposed requirements and priorities; and conducting regular meetings that are open to the public.

On August 25, 1996, the Army issued the final proposed plan to citizens and organizations, to provide the public with a explanation of the Army's preferred remedies for cleanup of groundwater at AOC 43G and 43J. The proposed plan also described the opportunities for public participation and provided details on the upcoming public comment period and public meetings.

During the week of August 25, the Army published a public notice announcing the proposed plan and public meeting in the Times Free Press and the Lowell Sun. The Army also made the proposed plan available to the public at the information repositories at the libraries in Ayer, Shirley, Lancaster, Harvard and at Devens BRAC Environmental Office.

From August 26 to September 25, 1996, the Army held a 30-day public comment period to accept public comments on the alternatives presented in the FS and the proposed plan and on other documents released to the public. On September 5, 1996, the Army held a public meeting at Devens to present the Army's proposed plan to the public and discuss the cleanup alternatives evaluated in the FS. This meeting also provided the opportunity for open discussion concerning the proposed cleanup.

All supporting documentation for the decision regarding AOC 43G and 43J is contained in the Administrative Record for review. The Administrative Record is a collection of all the documents considered by the Army in choosing the remedies at AOC 43G and 43J. On June 2, 1995, the Army made the Administrative Record available for public review at the Devens BRAC Environmental Office, and at the Ayer Town Hall, Ayer, Massachusetts. An index to the Administrative Record is available at the USEPA Records Center, 90 Canal Street, Boston, Massachusetts and is provided as Appendix D.

III. SUMMARY OF COMMENTS RECEIVED DURING THE PUBLIC COMMENT PERIOD AND ARMY RESPONSES

No comments were received during the public comment period.

ATTACHMENT A - PUBLIC MEETING TRANSCRIPT

Pages: 1 - 7

UNITED STATES ARMY
BASE REALIGNMENT AND CLOSURE
ENVIRONMENTAL OFFICE

Devens, Massachusetts

* * * *

PROPOSED PLAN

TO CLEAN UP RESERVE FORCES TRAINING AREAS

AOC 43G and 43J

* * * *

PUBLIC HEARING

BEFORE: James Chambers, Environmental Officer

* * * *

held at

Commerce Center General Conference Room
Devens, Massachusetts
Thursday September 5, 1996,
7:30 p.m.

(Carol Kusinitz, Registered Professional Reporter)

P R O C E E D I N G S

MR. CHAMBERS: Good evening. Welcome to the public hearing for the proposed plan for areas of contamination 43G and 43J, historic gas stations at Ft. Devens, Massachusetts.

My name is James Chambers. I'm the BRAC environmental coordinator, Base Realignment and Closure environmental coordinator for the U.S. Army at Ft. Devens.

This evening we're going to hold this public hearing to solicit comments on the proposed plan for remediation of these historic gas stations. What I would like to do is remind you that we are sending around an attendance sheet. We're required to maintain that as a public record for who is at this hearing. So, please, do sign it.

Also -- I'm going to solicit your comments. I'll mention that the public comment period began August 26th and is ongoing through September 25th. It's a 30-day public comment period. At that time we will respond formally to those comments and include that in the administrative record for the Record of Decision.

The Record of Decision will be a record of what will -- what the Army will do as a remedial action at these sites.

So, again, please stand up when you want to make a comment, and speak clearly and loudly for the stenographer to record your statements. Please announce your name and where you're from. And then I guess if you have questions during that time as well, we'll try to respond to the questions if we can this evening, but otherwise we may wait and respond to them formally in the response summary.

Is there any -- would anybody like to make a comment? Going once?

MR. MacIVER: Could we hear from other agencies, such as DEP and EPA, just a general feeling about this? Maybe that would be helpful. I realize this is a public comment period and they are agencies, but it might be helpful just to have a general sense from those groups.

MR. CHAMBERS: Okay. I'll offer them that opportunity, but I will state that all through the process the regulators are involved, and they comment, and their comments are recorded as part of the administrative record. So I'll invite them to

make a comment now if they would like to, but understand, if they want, to do so formally.

MR. MacIVER: Realizing it isn't a judgment, just an informal comment.

MS. WELSH: I'll take a stab. I'm Lynn Welsh from the Massachusetts Department of Environmental Protection, and I'm going to sit down.

We are actually sort of excited to try this method here at Ft. Devens and see it as a good location. There are concerns: Is it really happening? Have we done enough work to know exactly what the contaminant situation is?

But it's something that the industry and the sort of environmental community have been looking at for a while, instead of going to aggressive pump and treat or extensive studies to see what the contamination is. There is a lot of work -- science starting to be developed and, as I said, proved. So at least it is out there and being studied by universities and other people involved in the field.

So it makes sense to give it a try at a location that isn't problematic. It is sort of the

edge of the Army property, but EPA is involved, and these people here are pretty intent on doing regular monitoring and regular evaluations and setting up reasonable points where we'll make other decisions.

MR. KEEFE: I'm Jerry Keefe of the EPA. This was one of my -- two of my sites. We look at intrinsic bioremediation as a process that is going to last a long period of time. The monitoring of it will be effective enough to be able to see if the degradation is occurring effectively. We've done this at a few other sites. Pease Air Force Base, we have a natural attenuation ROD up there, and we're working on one also up at Loring in Maine.

So we're pretty familiar with what should be monitored for and what characteristics to look for to ensure biodegradation is occurring as well as contamination decrease. And there are other nutrients and things that you look for. To be more specific, the monitoring plan that we're going to develop will really bring it all together. So we can be pretty confident of the plan and are excited to have one here at Devens.

MR. CHAMBERS: Is there any -- would anybody else like to comment?

MR. MacIVER: My name is Don MacIver. I'm a resident of Littleton. I sit here representing the Massachusetts Association of Conservation Commissions.

I would like to thank you for the opportunity for the presentation. It sounds encouraging from what I've heard and what I've read, and it sounds as if it's somewhat innovative, certainly innovative technology. Environmental matters have been a concern for Ft. Devens, so it sounds encouraging and sounds like there are contingency plans in case the chosen method does not work. So it sounds encouraging. Thank you.

MR. CHAMBERS: Thank you.

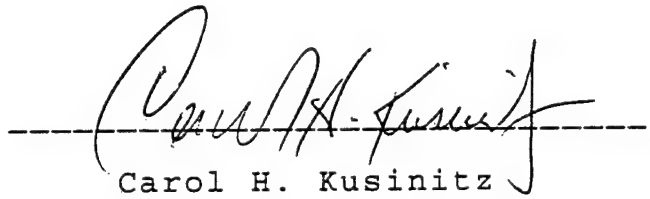
Would anybody else like to comment? Going once? Twice? Three times. (No response)

Thank you. This closes the public hearing portion of this meeting. Again I remind you that the public comment period extends to September 25th, so you are welcome to submit your comments in writing by that date.

(Whereupon the hearing was adjourned at 7:40 p.m.)

C E R T I F I C A T E

I, Carol H. Kusinitz, Registered Professional Reporter, do hereby certify that the foregoing transcript, Volume I, is a true and accurate transcription of my stenographic notes taken on September 5, 1996.



Carol H. Kusinitz

Registered Professional Reporter

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APPENDIX D - ADMINISTRATIVE RECORD INDEX

Fort Devens

Groups 2 & 7 Sites

Administrative Record File for

Index

Prepared for
New England Division
Corps of Engineers

by
ABB ENVIRONMENTAL SERVICES, INC.
107 Audubon Road, Wakefield, Massachusetts 01880 (617) 245-6606

Introduction

This document is the Index to the Administrative Record File for the Fort Devens Groups 2 & 7 Sites. Section I of the Index cites site-specific documents and Section II cites guidance documents used by U.S. Army staff in selecting a response action at the site. Some documents in this Administrative Record File Index have been cited but not physically included. If a document has been cross-referenced to another Administrative Record File Index, the available corresponding comments and responses have been cross-referenced as well.

The Administrative Record File is available for public review at EPA Region I's Office in Boston, Massachusetts, at the Fort Devens Environmental Management Office, Fort Devens, Massachusetts, and at the Ayer Town Hall, 1 Main Street, Ayer, Massachusetts. Supplemental/Addendum volumes may be added to this Administrative Record File. Questions concerning the Administrative Record should be addressed to the Fort Devens Base Realignment and Closure Office (BRAC).

Section I

Site-Specific Documents

ADMINISTRATIVE RECORD INDEX FILE

for

Fort Devens Groups 2 & 7 Sites

Compiled: April 22, 1996

1.0 Pre-Remedial

1.2 Preliminary Assessment

Cross Reference: The following Reports, Comments, and Responses to Comments (entries 1 through 6) are filed and cited as entries 1 through 6 in minor break 1.2 Preliminary Assessment of the Fort Devens Group 1A Administrative Record File Index.

Reports

1. "Final Master Environmental Plan for Fort Devens," Argonne National Laboratory (April 1992).
2. "Preliminary Zone II Analysis for the Production Wells at Fort Devens, MA, Draft Report", ETA Inc. (January 1994).

Comments

3. Comments Dated May 1, 1992 from Walter Rolf, Montachusett Regional Planning Commission on the April 1992 "Final Master Environmental Plan for Fort Devens," Argonne National Laboratory.
4. Comments Dated May 7, 1992 from James P. Byrne, EPA Region I on the April 1992 "Final Master Environmental Plan for Fort Devens," Argonne National Laboratory.
5. Comments Dated May 23, 1994 from D. Lynne Welsh, Commonwealth of Massachusetts Department of Environmental Protection on the January 1994 "Preliminary Zone II Analysis for the Production Wells at Fort Devens, MA, Draft Report", ETA Inc.

Responses to Comments

6. Response Dated June 29, 1992 from Carrol J. Howard, Fort Devens to the May 7, 1992 Comments from James P. Byrne, EPA Region I.

1.3 Site Inspection

Reports

1. "Final Task Order (Site Investigations) Work Plan," ABB Environmental Services, Inc. (December 1992).
2. "Final Task Order (Site Investigations) Work Plan - Historic Gas Stations," ABB Environmental Services, Inc. (December 1992).
3. "SI Data Packages - Army Environmental Center - Volume I," ABB Environmental Services, Inc. (January 1993).
4. "SI Data Packages - Army Environmental Center - Volume II," ABB Environmental Services, Inc. (January 1993).
5. "SI Data Package Meeting Notes for Groups 2 & 7 and Historic Gas Stations," ABB Environmental Services, Inc. (April 1993).
6. "Final SI Report, Groups 2 & 7 and Historic Gas Stations, Volume I," ABB Environmental Services, Inc. (May 1993).
7. "Final SI Report, Groups 2 & 7 and Historic Gas Stations, Volume II," ABB Environmental Services, Inc. (May 1993).
8. "Final SI Report, Groups 2 & 7 and Historic Gas Stations, Volume III" ABB Environmental Services, Inc. (May 1993).
9. "Final SI Report, Groups 2 & 7 and Historic Gas Stations, Volume IV," ABB Environmental Services, Inc. (May 1993).
10. "Final Supplemental Site Investigation Work Plan," ABB Environmental Services, Inc. (August 1993).
11. "Supplemental Site Investigation Data Package Groups 2 & 7 and Historic Gas Stations," ABB Environmental Services, Inc. (January 1994).
12. "Supplemental Site Investigation Data Package Meeting Notes Groups 2 & 7 and Historic Gas Stations," ABB Environmental Services, Inc. (March 1994).

Missing

13. "Supplemental Sampling Plan for Study Area 42, Popping Furnace," OHM Remediation Corporation (October 14, 1994).

Comments

14. Comments Dated January 11, 1993 from D. Lynne Chappell, Commonwealth of Massachusetts Department of Environmental Protection on the December 1992 "Final Task Order (Site Investigation) Work Plan," ABB Environmental Services, Inc.
15. Comments Dated January 12, 1993 from James P. Byrne, EPA Region I on the December 1992 "Final Task Order (Site Investigation) Work Plan," ABB Environmental Services, Inc. and the December 1992 "Final Task Order (Site Investigation)

Work Plan - Historic Gas Stations," ABB Environmental Services, Inc.

16. Comments Dated July 15, 1993 from James P. Byrne, EPA Region I on the May 1993 "Final SI Report, Groups 2 & 7 and Historic Gas Stations," ABB Environmental Services, Inc.
17. Comments Dated July 9, 1993 and July 19, 1993 from D. Lynne Chappell, Commonwealth of Massachusetts Department of Environmental Protection on the May 1993 "Final SI Report, Groups 2 & 7 and Historic Gas Stations," ABB Environmental Services, Inc.
18. Comments Dated March 7, 1994 from Molly Elder, Commonwealth of Massachusetts Department of Environmental Protection on the January 1994 "Supplemental Site Investigation Data Package, Groups 2 & 7 and Historic Gas Stations," ABB Environmental Services, Inc.
19. Comments Dated March 23, 1994 from James P. Byrne, EPA Region I on the January 1994 "Supplemental Site Investigation Data Package, Groups 2 & 7 and Historic Gas Stations," ABB Environmental Services, Inc.
20. Comments Dated November 2, 1994 from D. Lynne Welsh, Commonwealth of Massachusetts Department of Environmental Protection on the October 14, 1994 "Supplement Sampling Plan for Study Area 42, Popping Furnace," OHM Remediation Corporation.

Responses to Comments

21. Responses Dated September 1993 from U. S. Army Environmental Center on the following document: Final Site Investigation Report, Groups 2 & 7 and Historic Gas Stations, dated May 1993.
22. Cross Reference: Responses Dated September 1993 from U.S. Army Environmental Center on the following document: Draft Supplemental Site Investigation Work Plan, (Appendix M of Final SI Report), dated May 1993. [These Responses are filed and cited as entry number 18 in the Responses to Comments section of this minor break].
23. Responses Dated September 1994 from U.S. Army Environmental Center on the Supplemental Site Investigation Data Package, Fort Devens Groups 2 & 7 and Historic Gas Stations.

Comments to Responses to Comments

24. Comments Dated September 30, 1993 from D. Lynne Welsh, Commonwealth of Massachusetts Department of

Environmental Protection on the Responses to Comments Package dated September 1993 from the U.S. Army Environmental Center.

25. Comments Dated November 27, 1994 from D. Lynne Welsh, Commonwealth of Massachusetts Department of Environmental Protection on the Army Responses to Comments, Supplemental Site Investigation Data Package, Groups 2, 7, and Historic Gas Stations, Fort Devens, Ma.

2.0 Removal Response

2.2 Removal Response Reports

Reports

1. "Draft Final Closure Report Study Area 49, Fort Devens, Massachusetts," OHM Remediation Services Corporation (October 28, 1994).
2. "Draft Final Closure Report Study Area 43D, Fort Devens, Massachusetts," OHM Remediation Services Corporation (November 21, 1994).
3. "Draft Final Closure Report Study Area 56, Fort Devens, Massachusetts," OHM Remediation Services Corporation (January 24, 1995).

Comments

4. Comments Dated December 29, 1994 from D. Lynne Welsh, Commonwealth of Massachusetts Department of Environmental Protection on the October 28, 1994 "Draft Final Closure Report, Study Area 49, Fort Devens, Massachusetts," (OHM Remediation Services Corporation).
5. Comments Dated January 6, 1995 from D. Lynne Welsh, Commonwealth of Massachusetts Department of Environmental Protection on the November 21, 1994 "Draft Final Closure Report, Study Area 43D, Fort Devens, Massachusetts," (OHM Remediation Services Corporation).
6. Comments Dated March 17, 1995 from D. Lynne Welsh, Commonwealth of Massachusetts Department of Environmental Protection on the January 24, 1995 "Draft Final Closure Report, Study Area 56, Fort Devens, Massachusetts," OHM Remediation Services Corporation.

2.9 Action Memoranda

Reports

1. "Final Contract Plans and Specifications Clean Out and Closure, Lake George Study Area 45 (SA 45)," ABB Environmental Services, Inc. (January 1994).
2. "Final Contract Design Plans and Specifications Contaminated Soil Removal, Various Sites, Fort Devens, Massachusetts," ABB Environmental Services, Inc. (April 1994).
3. "Final Action Memoranda, Various Sites, Fort Devens,. Massachusetts," ABB Environmental Services, Inc. (June 1994).
4. "Addendum - Revision 2 for Final Contract Design Plans & Specifications Contaminated Soil Removal, Various Sites, Fort Devens, Massachusetts," ABB Environmental Services, Inc. (September 9, 1994).
5. "Addendum - Revision 3 for Final Contract Design Plan & Specifications Contaminated Soil Removal, Various Sites, Fort Devens, Massachusetts," ABB Environmental Services, Inc. (September 16, 1994).
6. "Final Addendum - Revisions 2 and 3 for Final Contract Design Plan & Specifications Contaminated Soil Removal, Various Sites, Fort Devens, Massachusetts," ABB Environmental Services, Inc. (October 28, 1994).
7. "Draft Addendum - Revision 4 for Final Contract Design Plans & Specifications Contaminated Soil Removal, Various Sites, Fort Devens, Massachusetts," ABB Environmental Services, Inc. (March 17, 1995).

Comments

8. Comments Dated February 17, 1994 from D. Lynne Welsh, Commonwealth of Massachusetts Department of Environmental Protection on the January 1994 "Draft Contract Design Plans and Specifications Contaminated Soil Removal, Various Sites, Fort Devens, Massachusetts," ABB Environmental Services, Inc.
9. Comments Dated May 5, 1994 from D. Lynne Welsh, Commonwealth of Massachusetts Department of Environmental Protection on the April 1994 "Draft Action Memoranda, Various Sites, Fort Devens, Massachusetts," ABB Environmental Services, Inc.
10. Comments Dated May 19, 1994 from James P. Byrne, EPA Region I on the April 1994 "Draft Action Memoranda, Various Sites, Fort Devens, Massachusetts," ABB Environmental Services, Inc.

11. Comments Dated June 10, 1994 from D. Lynne Welsh, Commonwealth of Massachusetts Department of Environmental Protection on the April 1994 "Final Contract Design Plans and Specifications, Contaminated Soil Removal, Various Sites, Fort Devens, Massachusetts," ABB Environmental Services, Inc.
12. Comments Dated August 11, 1994 from D. Lynne Welsh, Commonwealth of Massachusetts Department of Environmental Protection on the June 1994 "Final Action Memoranda, Various Sites, Fort Devens, Massachusetts," ABB Environmental Services,Inc.
13. Comments Dated August 16, 1994 from D. Lynne Welsh, Commonwealth of Massachusetts Department of Environmental Protection on the June 10, 1994 "Addendum - Revision 1 for Final Contract Design Plans & Specifications, Contaminated Soil Removal, Various Sties, Fort Devens, Massachusetts (ABB Environmental Services, Inc.).
14. Comments Dated September 28, 1994 from D. Lynne Welsh, Commonwealth of Massachusetts Department of Environmental Protection on the September 9, 1994 "Addendum - Revision 2 for Final Contract Design Plans and Specifications Contaminated Soil Removal Various Sites, Fort Devens, Massachusetts," (ABB Environmental Services, Inc.).
15. Comments Dated December 20, 1994 from D. Lynne Welsh, Commonwealth of Massachusetts Department of Environmental Protection on the October 28, 1994 "Final Addendum - Revisions 2 and 3 for Final Contract Design Plans & Specifications, Contaminated Soil Removal Various Sites, Fort Devens, Massachusetts," (ABB Environmental Services, Inc).

Responses to Comments

16. Responses Dated March 1994 from U.S. Army Environmental Center on the following document: Draft Contract Design Plans and Specifications Contaminated Soil Removal, Various Sites, Fort Devens, Massachusetts dated January 1994.
17. Responses Dated June 1994 from U.S. Army Environmental Center on the following document: Draft Action Memoranda, Various Sites, Fort Devens, Massachusetts dated April 1994.
18. Responses Dated January 25, 1994 from U.S. Army Environmental Center on the following document: "Draft Design Specifications and Plans Lake George Street Vehicle Wash Area (Study Area 45).
19. Responses Dated September 9, 1994 from U.S. Army Environmental Center on the Addendum - Revisions 2 Final

Contract Design Plans & Specifications Contaminated Soil Removal Various Sites, Fort Devens, Massachusetts.

20. Response Dated October 28, 1994 from U.S. Army Environmental Center on the Final Addendum - Revisions 2 and 3 for Final Contract Design Plans & Specifications, Contaminated Soil Removal, Various Sites, Fort Devens, Massachusetts.

3.0 Remedial Investigation (RI)

3.2 Sampling and Analysis Data

Reports

1. Cross Reference: "Method for Determining Background Concentrations - Inorganic Analytes in Soil and Groundwater - Fort Devens," ABB Environmental Services, Inc. (January 20, 1993) [Filed and cited as entry number 1 in minor break 3.2 Sampling and Analysis Data of the Fort Devens Group 1A Sites Administrative Record Index].
2. "Data Comparison Report, Group 2 & 7 Sites Through Round 1 Sampling," CDM Federal Programs Corporation (March 1993).
3. "Draft Quality Assurance Project Plan, Remedial Investigations, Groups 2 & 7 and South Post Impact Area, Fort Devens, Massachusetts," Ecology and Environment, Inc. (June 1993).

3.4 Interim Deliverables

Reports

1. Cross Reference: "Final Ground Water Flow Model at Fort Devens," Engineering Technologies Associates, Inc. (May 24, 1993) [Filed and cited as entry number 1 in minor break 3.4 Interim Deliverables of the Fort Devens Group 1A Sites Administrative Record Index].
2. "Final Projects Operations Plan - Volume I of III," ABB Environmental Services, Inc. (December 1992).
3. "Final Projects Operations Plan - Volume II of III - Appendix A: Health and Safety Plan," ABB Environmental Services, Inc. (December 1992).
4. "Final Projects Operations Plan - Volume III of III - Appendix B: Laboratory QA Plan; Appendix C: USATHAMA-Certified Analytical Methods," ABB Environmental Services, Inc. (December 1992).

Comments

5. Comments Dated January 12, 1993 from James P. Byrne, EPA Region I on the December 1992 "Final Projects Operations Plan," ABB Environmental Services, Inc.
6. Cross Reference: Comments Dated February 1, 1993 from James P. Byrne, USEPA Region I and D. Lynne Chappell, Commonwealth of Massachusetts Department of Environmental Protection on the October 30, 1992 "Draft Final Ground Water Flow Model at Fort Devens," Engineering Technologies Associates, Inc. [Filed and cited as entry number 2 in minor break 3.4 Interim Deliverables of the Fort Devens Group 1A Sites Administrative Record File Index].
7. Comments Dated February 17, 1993 from D. Lynne Chappell, Commonwealth of Massachusetts Department of Environmental Protection on the December 1992 "Final Project Operations Plan," ABB Environmental Services, Inc.

3.5 Applicable or Relevant and Appropriate Requirements (ARARs)

Cross Reference: The following report (entries 1 and 2 are filed and cited as entries 1 and 2 in minor break 3.5 Applicable or Relevant and Appropriate Requirements (ARARs) of the Fort Devens Groups 3, 5, & 6 Sites Administrative Record Index.

Reports

1. "Draft Applicable or Relevant and Appropriate Requirements (ARARs) for CERCLA Remedial Actions," U.S. Army Toxic and Hazardous Materials Agency (June 1992).
2. "Draft Assessment of Location-Specific Applicable or Relevant and Appropriate Requirements (ARARs) for Fort Devens, Massachusetts," U. S. Army Toxic and Hazardous Materials Agency (September 1992).

3.7 Work Plans and Progress Reports

Reports

1. "Draft Task Order Work Plan Area of Contamination (AOC) 41, AOC 43G and 43J, Fort Devens, Draft Remedial Investigation/Feasibility Study Work Plan, Groups 2 & 7 and Historic Gas Stations," ABB Environmental Services, Inc. (May 1994).
2. "Final Task Order Work Plan Area of Contamination (AOC) 41, AOC 43G, and AOC 43J, Fort Devens, Final Remedial

Investigations/Feasibility Study Work Plan, Groups 2, 7, and Historic Gas Stations," ABB Environmental Services, Inc (August 1994).

3. "Revised Final Task Order Work Plan Area of Contamination (AOC) 41, AOC 43G, and AOC 43J, Fort Devens, Revised Final Remedial Investigations/Feasibility Study Work Plan, Groups 2, 7, and Historic Gas Stations," ABB Environmental Services, Inc. (October 1994).

Comments

4. Comments Dated July 06, 1994 from D. Lynne Welsh, Commonwealth of Massachusetts Department of Environmental Protection the May 1994 "Draft Task Order Work Plan Area of Contamination (AOC) 41, AOC 43G and 43J, Fort Devens, Draft Remedial Investigation/Feasibility Study Work Plan, Groups 2 & 7 and Historic Gas Stations," ABB Environmental Services, Inc.
5. Comments Dated October 19, 1994 from James P. Byrne, USEPA Region I, on the Final RI/FS Work Plan for AOCs 41, 43G, and 43J and the Response to Comments for this Document.
6. Comments Dated October 21, 1994 from D. Lynne Welsh, Commonwealth of Massachusetts Department of Environmental Protection on the August 1994 "Final Task Order Work Plan, Area of Contamination (AOC) 41, 43G, and AOC 43J.
7. Comments Dated December 15, 1994 from D. Lynne Welsh, Commonwealth of Massachusetts Department of Environmental Protection on the Revised Final Remedial Investigation/Feasibility Study, Revised Final Task Order Work Plans AOC 41, AOC 43G, and AOC 43J.

Response to Comments

8. Responses Dated September 1994 from U.S. Army Environmental Center on the following Document: Draft RI/FS Work Plans for Area of Contamination (AOC) 41, AOC 43G, and AOC 43J.

Comments to Responses to Comments

9. Cross Reference: Comments Dated October 19, 1994 from D. Lynne Welsh, Commonwealth of Massachusetts Department of Environmental Protection on the Final RI/FS Work Plan for AOCs 41, 43G and 43J and the Response to Comments for this

document. [Filed and cited as entry number 6 in the Comments section of this minor break].

4.0 Feasibility Study (FS)

4.7 Work Plans and Progress Reports

Reports

1. Cross-Reference: "Draft Task Order Work Plan Areas of Contamination (AOC) 41, AOC 43G and 43J, Fort Devens, Draft Remedial Investigation/Feasibility Study Work Plan, Groups 2 & 7 and Historic Gas Stations," ABB Environmental Services, Inc. (May 1994) [Filed and cited as entry number 1 in minor break 3.7 Work Plans and Progress Reports]
2. "Draft Work Plan Predesign Field Work and Landfill Study, Fort Devens, Massachusetts," ABB Environmental Services, Inc. (June 1994).

Comments

3. Cross Reference: Comments Dated July 6, 1994 from D. Lynne Welsh, Commonwealth of Massachusetts Department of Environmental Protection the May 1994 "Draft Task Order Work Plan Area of Contamination (AOC) 41, AOC 43G and 43J, Fort Devens, Draft Remedial Investigation/Feasibility Study Work Plan, Groups 2 & 7 and Historic Gas Stations," ABB Environmental Services, Inc. [Filed and cited as entry number 2 in the minor break 3.7 Work Plans and Progress Reports].

5.0 Record of Decision (ROD)

5.4 Record of Decision

Reports

1. "No Further Action Decision Document Under CERCLA, Fort Devens Study Area 58, Buildings 2648 and 2650 Fuel Oil Spills," ABB Environmental Services, Inc. (January 1994).
2. "No Further Action Decision Document Under CERCLA, Fort Devens Study Area 43C,E,F,,K,L,M,P,Q,R, and S," ABB Environmental Services, Inc. (January 1994).
3. "No Further Action Decision Document Under CERCLA, Fort Devens Study Area 28, Fort Devens Waste Explosives

Detonation Range (Training Area 14)," ABB Environmental Services, Inc. (January 1994).

4. "No Further Action Decision Document Under CERCLA, Decision Briefing, Fort Devens Study Area 28, Fort Devens Waste Explosives Detonation Range (Training Area 14)," ABB Environmental Services, Inc. (January 1994).
5. "Draft No Further Action Decision Document Under CERCLA, Study Area 13, Landfill No. 9, Groups 2 & 7 and Historic Gas Stations, Fort Devens, Massachusetts," ABB Environmental Services, Inc. (May 1994).
6. "Draft No Further Action Decision Document Under CERCLA, Study Area 12, Landfill No. 8, Groups 2 & 7 and Historic Gas Stations, Fort Devens, Massachusetts," ABB Environmental Services, Inc. (May 1994).
7. "Draft No Further Action Decision Document Under CERCLA, Study Area 14, Landfill No. 10, Groups 2 & 7 and Historic Gas Stations, Fort Devens, Massachusetts," ABB Environmental Services, Inc. (May 1994).
8. "Draft No Further Action Decision Document Under CERCLA, Study Area 43B Historic Gas Station Sites, Groups 2 & 7 and Historic Gas Stations, Fort Devens, Massachusetts," ABB Environmental Services, Inc. (May 1994).
9. "Draft No Further Action Decision Document Under CERCLA, Study Area 43N, Historic Gas Station Sites, Groups 2 & 7 and Historic Gas Stations, Fort Devens, Massachusetts," ABB Environmental Services, Inc. (May 1994).
10. "No Further Action Decision Under CERCLA, Study Area 43B, Historic Gas Station Sites, Fort Devens, Massachusetts," ABB Environmental Services, Inc. (January 1995).
11. "No Further Action Decision Under CERCLA, Study Area 43C, Historic Gas Station Sites, Fort Devens, Massachusetts," ABB Environmental Services, Inc. (January 1995).
12. "No Further Action Decision Under CERCLA, Study Area 43E, Historic Gas Station Sites, Fort Devens, Massachusetts," ABB Environmental Services, Inc. (January 1995).
13. "No Further Action Decision Under CERCLA, Study Area 43F, Historic Gas Station Sites, Fort Devens, Massachusetts," ABB Environmental Services, Inc. (January 1995).
14. "No Further Actio Decision Under CERCLA, Study Area 43K, Historic Gas Station Sites, Fort Devens, Massachusetts," ABB Environmental Services, Inc. (January 1995).
15. "No Further Action Decision Under CERCLA, Study Area 43L, Historic Gas Station Sites, Fort Devens, Massachusetts," ABB Environmental Services, Inc. (January 1995).

16. "No Further Action Decision Under CERCLA, Study Area 43M, Historic Gas Station Sites, Fort Devens, Massachusetts," ABB Environmental Services, Inc. (January 1995).
17. "No Further Action Decision Under CERCLA, Study Area 43N, Historic Gas Station Sites, Fort Devens, Massachusetts," ABB Environmental Services, Inc. (January 1995).
18. "No Further Action Decision Under CERCLA, Study Area 43P, Historic Gas Station Sites, Fort Devens, Massachusetts," ABB Environmental Services, Inc. (January 1995).
19. "No Further Action Decision Under CERCLA, Study Area 43Q, Historic Gas Station Sites, Fort Devens, Massachusetts," ABB Environmental Services, Inc. (January 1995).
20. "No Further Action Decision Under CERCLA, Study Area 43R, Historic Gas Station Sites, Fort Devens, Massachusetts," ABB Environmental Services, Inc. (January 1995).
21. "No Further Action Decision Under CERCLA, Study Area 43S, Historic Gas Station Sites, Fort Devens, Massachusetts," ABB Environmental Services, Inc. (January 1995).
22. "No Further Action Decision Under CERCLA, Study Area 14, Landfill No. 14, Fort Devens, Massachusetts," ABB Environmental Services, Inc. (January 1995).
23. "No Further Action Decision Under CERCLA, Fort Devens Study Area 28, Waste Explosives Detonation Range (Training Area 14)," ABB Environmental Services, Inc. (January 1995).
24. "No Further Action Decision Under CERCLA, Study Area 48, Building 202 Leaking Underground Storage Tank Site, Fort Devens, Massachusetts," ABB Environmental Services, Inc. (January 1995).

Comments

25. Comments Dated September 30, 1993 from James P. Byrne, EPA Region I on the August 1993 "Draft Decision Document, Fort Devens Study Area 58, Buildings 2648 and 2650 Fuel Oil Spills," ABB Environmental Services, Inc.
26. Comments Dated October 1 1993 from D. Lynne Welsh, Commonwealth of Massachusetts Department of Environmental Protection on the August 1993 "Draft Decision Document, Fort Devens Study Area 58, Buildings 2648 and 2650 Fuel Oil Spill," ABB Environmental Services, Inc.
27. Comments Dated September 30, 1994 from James P. Byrne, EPA Region I on the August 1993 "Draft Decision Document, Fort Devens Study Area 28, Waste Explosives Detonation Range (Training Area 14)," ABB Environmental Services, Inc.
28. Comments Dated November 3, 1993 from D. Lynne Welsh, Commonwealth of Massachusetts Department of

Environmental Protection on the September 1993 "Draft Decision Document Fort Devens Historic Gas Stations, Study Area 43C,E,F,K,L,M,P,Q,R, and S," ABB Environmental Services, Inc.

29. Comments Dated November 17, 1993 from James P. Byrne on the September 1993 "Draft Decision Document Fort Devens Historic Gas Stations, Study Area 43C,E,F,K,L,M,P,Q,R, and S," ABB Environmental Services, Inc.
30. Comments Dated June 29, 1994 from D. Lynne Welsh, Commonwealth of Massachusetts Department of Environmental Protection on the May 1994 "Draft No Further Action Decision Document Under CERCLA, Study Area 13, Landfill No. 9, Groups 2 & 7 and Historic Gas Stations, Fort Devens, Massachusetts," ABB Environmental Services, Inc., "Draft No Further Action Decision Document Under CERCLA, Study Area 12, Landfill No. 8, Groups 2 & 7 and Historic Gas Stations, Fort Devens, Massachusetts," ABB Environmental Services, Inc., "Draft No Further Action Decision Document Under CERCLA, Study Area 14, Landfill No. 10, Groups 2 & 7 and Historic Gas Stations, Fort Devens, Massachusetts," ABB Environmental Services, Inc., "Draft No Further Action Decision Document Under CERCLA, Study Area 43B, Historic Gas Station Sites, Groups 2 & 7 and Historic Gas Stations, Fort Devens, Massachusetts," ABB Environmental Services, Inc., "Draft No Further Action Decision Document Under CERCLA, Study Area 43N, Historic Gas Station Sites, Groups 2 & 7 and Historic Gas Stations, Fort Devens, Massachusetts," ABB Environmental Services, Inc.
31. Comments Dated September 30, 1994 from James P. Byrne, EPA Region I on the August 1993 "Draft Decision Document, Fort Devens Study Area 28, Waste Explosives Detonation Range (Training Area 14)," ABB Environmental Services, Inc.
32. Comments Dated June 30, 1994 from James P. Byrne, USEPA Region I on the No Further Action Decision Under CERCLA Documents for Study Area 28 and 47.
33. Comments Dated March 17, 1995 from D. Lynne Welsh, Commonwealth of Massachusetts Department of Environmental

Response to Comments

34. Responses Dated January 1995 from U.S. Army Environmental Center on the following documents: Draft No Further Action Decision Under CERCLA SA 14, SA 43B and SA 43N -

Groups 2, 7, and Historic Gas Stations, Fort Devens, Massachusetts.

35. Responses Dated January 1995 from U.S. Army Environmental Center on the following documents: Draft No Further Action Decision Under CERCLA SA 43C, E, F, L, M, P, Q, R, S - Groups 2, 7, and Historic Gas Stations, Fort Devens, Massachusetts.
36. Responses Dated January 1995 from U.S. Army Environmental Center on the following documents: Draft No Further Action Decision Under CERCLA SA 58 - Groups 2, 7, and Historic Gas Stations, Fort Devens, Massachusetts.

10.0 Enforcement

10.16 Federal Facility Agreements

1. Cross Reference: "Final Federal Facility Agreement Under CERCLA Section 120," EPA Region I and U.S. Department of the Army (November 15, 1991) with attached map [Filed and cited as entry number 1 in minor break 10.16 Federal Facility Agreements of the Fort Devens Group 1A Sites Administrative Record Index].

13.0 Community Relations

13.2 Community Relations Plans

Reports

1. Cross Reference: "Final Community Relations Plan," Ecology and Environment, Inc. (February 1992) [Filed and cited as entry number 1 in minor break 13.2 Community Relations Plans of the Fort Devens Group 1A Sites Administrative Record Index].

Comments

2. Cross Reference: Letter from James P. Byrne, EPA Region I to F. Timothy Prior, Fort Devens (March 19, 1992), concerning approval of the February 1992 "Final Community Relations Plan," Ecology and Environment, Inc.

13.11 Technical Review Committee Documents

Cross-Reference: The following documents cited below as entries number 1 through 8 are filed and cited as entries number 1 through

8 in minor break 13.11 Technical Review Committee Documents of the Fort Devens Group 1A Sites Administrative Record.

1. Technical Review Committee Meeting Agenda and Summary (March 21, 1991).
2. Technical Review Committee Meeting Agenda and Summary (June 27,1991).
3. Technical Review Committee Meeting Agenda and Summary (September 17, 1991).
4. Technical Review Committee Meeting Agenda and Summary (December 11, 1991).
5. Technical Review Committee Meeting Agenda and Summary (March 24, 1992).
6. Technical Review Committee Meeting Agenda and Summary (June 23, 1992).
7. Technical Review Committee Meeting Agenda and Summary (September 29, 1992).
8. Technical Review Committee Meeting Agenda and Summary (January 5, 1993).

17.0 Site Management Records

17.6 Site Management Plans

Cross-Reference: The following Reports, Comments, and Responses to Comments (entries 1 through 9) are filed and cited in minor break 17.6 Site Management Records of the Groups 3, 5, & 6 Administrative Record Index unless otherwise noted below.

Reports

1. "Final Quality Assurance Project Plan," Ecology and Environment, Inc. (November 1991).
2. "General Management Procedures, Excavated Waste Site Soils, Fort Devens, Massachusetts," ABB Environmental Services, Inc. (January 1994).

Comments

3. Cross Reference: Comments from James P. Byrne, EPA Region I on the November 1991 "Final Quality Assurance Project Plan," Ecology and Environment, Inc. [These Comments are filed and cited as a part of entry number 8 in the Responses to Comments section of this minor break].
4. Comments Dated December 16, 1993 from Molly J. Elder, Commonwealth of Massachusetts Department of

Environmental Protection on the November 1993 "Draft General Management Procedures, Excavated Waste Site Soils, Fort Devens, Massachusetts," ABB Environmental Services, Inc.

5. Comments Dated December 27, 1993 from James P. Byrne, EPA Region I on the November 1993 "Draft General Management Procedures, Excavated Waste Site Soils, Fort Devens, Massachusetts," ABB Environmental Services, Inc. [Filed and cited as entry number 4 in minor break 4.4 Interim Deliverables of the AOCs 44/52 Administrative Record Index.]
6. Comments Dated March 11, 1994 from D. Lynne Welsh, Commonwealth of Massachusetts Department of Environmental Protection on the January 1994 "General Management Procedures, Excavated Waste Site Soils, Fort Devens, Massachusetts," ABB Environmental Services, Inc.

Responses to Comments

7. Cross-Reference: U. S. Army Environmental Center Responses to Comments on the following documents: Feasibility Study Report; Biological Treatability Study Report; Feasibility Study Report - New Alternative 9; Draft General Management Procedures Excavated Waste Site Soils; and Draft Siting Study Report, dated January 25, 1994. [These Responses to Comments are filed and cited as a part of entry number 7 in the Responses to Comments section of minor break 4.4 Interim Deliverables of the AOCs 44/52 Administrative Record Index.]
8. Response from Fort Devens to Comments from James P. Byrne, EPA Region I on the November 1991 "Final Quality Assurance Project Plan," Ecology and Environment, Inc.
9. Cross-Reference: U.S. Army Environmental Center Responses to Comments for the following documents: Final Feasibility Study Report; Draft Proposed Plan; Revised Draft Proposed Plan; Draft Excavated Soils Management Plan; Final General Management Procedures Excavated Waste Site Soils; and Biological Treatability Study Report, dated May 1994. [These Responses to Comments are filed and cited as entry number 8 in the Responses to Comments section of minor break 4.4 Interim Deliverables of the AOCs 44/52 Administrative Record Index.]

17.9 Site Safety Plans

Cross Reference: The following documents (entries 1 through 3) are filed and cited in minor break 17.9 Site Safety Plans of the Fort Devens Group 1A Administrative Record File Index unless otherwise noted below.

Reports

1. "Final Health and Safety Plan," Ecology and Environment, Inc. (November 1991).

Comments

2. Cross Reference: Comments from James P. Byrne, EPA Region I on the November 1991 "Final Health and Safety Plan," Ecology and Environment, Inc. [These Comments are filed and cited as a part of entry number 8 in minor break 17.6 Site Management Plans of the Group 1A Sites Administrative Record File Index].

Responses to Comments

3. Response from Fort Devens to Comments from James P. Byrne, EPA Region I on the November 1991 "Final Health and Safety Plan," Ecology and Environment, Inc.

Section II

Guidance Documents

GUIDANCE DOCUMENTS

The following guidance documents were relied upon during the Fort Devens cleanup. These documents may be reviewed, by appointment only, at the Environmental Management Office at Fort Devens, Massachusetts.

1. Occupational Safety and Health Administration (OSHA). Hazardous Waste Operation and Emergency Response (Final Rule, 29 CFR Part 1910, Federal Register. Volume 54, Number 42) March 6, 1989.
2. USATHAMA. Geotechnical Requirements for Drilling Monitoring Well, Data Acquisition, and Reports, March 1987.
3. USATHAMA. IRDMIS User's Manual, Version 4.2, April 1991.
4. USATHAMA. USATHAMA Quality Assurance Program: PAM-41, January 1990.
5. USATHAMA. Draft Underground Storage Tank Removal Protocol - Fort Devens, Massachusetts, December 4, 1992.
6. U.S. Environmental Protection Agency. Guidance for Preparation of Combined Work/Quality Assurance Project Plans for Environmental Monitoring: OWRS QA-1, May 1984.
7. U.S. Environmental Protection Agency. Office of Research and Development Interim Guidelines and Specifications for Preparing Quality Assurance Project Plans: QAMS-005/80, 1983.
8. U.S. Environmental Protection Agency. Office of Emergency and Remedial Response. Interim Final Guidance for Conducting Remedial Investigations and Feasibility Studies Under CERCLA, (OSWER Directive 9355.3-01, EPA/540/3-89/004, 1986.
9. U.S. Environmental Protection Agency. Test Methods for Evaluating Solid Waste: EPA SW-846 Third Edition, September 1986.
10. U.S. Environmental Protection Agency. Office of Emergency and Remedial Response. Risk Assessment Guidance for Superfund, Volume I. Human Health Evaluation Manual (Part A), (EPA/540/1-89/002), 1989.
11. U.S. Environmental Protection Agency. Hazardous Waste Management System; Identification and Listing of Hazardous Waste; Toxicity Characteristic Revisions, (Final Rule, 40 CFR Part 261 et al., Federal Register Part V), June 29, 1990.

APPENDIX E - DECLARATION OF STATE CONCURRENCE

COMMONWEALTH OF MASSACHUSETTS
EXECUTIVE OFFICE OF ENVIRONMENTAL AFFAIRS
DEPARTMENT OF ENVIRONMENTAL PROTECTION
CENTRAL REGIONAL OFFICE

WILLIAM F. WELD
Governor

ARGEO PAUL CELLUCCI
Lt. Governor

TRUDY COXE
Secretary

DAVID B. STRUHS
Commissioner

October 10, 1996

Ms. Linda Murphy, Director
U.S. Environmental Protection Agency
Region I-JFK Federal Building
Boston, MA 02203

RE: Record of Decision; Areas of Contamination 43G and 43J
Devens, Massachusetts

Dear Ms. Murphy,

The Massachusetts Department of Environmental Protection (MADEP) has reviewed the above-referenced Record of Decision (ROD) as recommended by the United States Army and the U.S. Environmental Protection Agency (EPA), Region I for the intrinsic bioremediation of Areas of Contamination (AOC) 43G and 43J at the former Fort Devens. The MADEP has worked closely with the Army and EPA in the development of the preferred alternative and herein concurs with the Army's choice of remedy.

The ROD covers two Historic Gas Stations that were identified in the Master Environmental Plan prepared through the Army Installation Restoration Program. Based on past use, these areas were recognized as potential sources of groundwater contamination and subsequently recommended for investigation. Both sites have been through Site Investigations, Supplemental Site Investigations, Remedial Investigations and Feasibility Studies. AOCs 43G and 43J and the properties immediately downgradient will be retained in Army ownership as part of the Army Reserve Enclave.

The chosen remedy includes additional data collection during the remedial design phase of the intrinsic bioremediation program, groundwater modeling of chemical fate and transport, installation of additional groundwater monitoring wells, development of a long-term monitoring program designed to demonstrate contaminant degradation, annual reporting, and five year project reviews. These oversight programs are key to the success of this remedy.

MADEP's concurrence with this remedy is premised on the ability of oil and chemicals of potential concern (CPCs) to be biologically and naturally attenuated before the contaminant plumes migrate off Army property. An area located sufficiently inside the property boundary will be identified in the long-term monitoring plan in which compliance will be determined, according to clean-up criteria stated in the ROD that, at a minimum, will meet drinking water standards and be based on adequate analytical parameters.

The MADEP would like to thank the US Army, particularly Jim Chambers, Fort Devens BRAC Environmental Coordinator; and Jerry Keefe, EPA Remedial Project Manager, for their efforts to ensure that the people and the environment of the Commonwealth of Massachusetts are protected in the selection of the remedy for these complex sites.

We look forward to continuing to work with the EPA and the Army during the implementation of the remedial alternatives at these two sites and further clean-up activities on the other Devens sites. If you have any questions, please feel free to contact Christopher Knuth at (508) 767-2829 or Lynne Welsh at (508) 792-7653, ext. 3851.

Sincerely,

E. Gail Suchman

E. Gail Suchman
Regional Director
DEP-CERO

P:\CKNUTH\43ROD

cc: Informational Repositories
Jim Chambers, Fort Devens BEC
Jim Byrne, EPA
Ron Ostrowski, Mass Land Bank
Jay Naparstek, MADEP
Rebecca Cutting, MADEP
Andy Cohen, MADEP, OGC, Boston

APPENDIX F - GLOSSARY OF ACRONYMS AND ABBREVIATIONS

GLOSSARY OF ACRONYMS AND ABBREVIATIONS

AAFES	Army Air Force Exchange Service
AOC	Area of Contamination
ARAR	Applicable or Relevant and Appropriate Requirement
BETX	benzene, ethylbenzene, toluene, and xylene
bgs	below ground surface
BRAC	Base Realignment and Closure Act
CAC	Citizen's Advisory Committee
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
CMR	Code of Massachusetts Regulations
CPC	chemical of potential concern
CSF	cancer slope factor
EBS	Environmental Baseline Survey
FS	Feasibility Study
GC	gas chromatograph
HI	Hazard Index
HQ	Hazard Quotient
IAG	Interagency Agreement
IRP	Installation Restoration Program
MADEP	Massachusetts Department of Environmental Protection
MCL	Maximum Contaminant Level
MCP	Massachusetts Contingency Plan
MEP	Master Environmental Plan
mg/L	milligrams per liter
MMCL	Massachusetts Maximum Contaminant Level
NFA	No Further Action
NPL	National Priorities List
NCP	National Contingency Plan

GLOSSARY OF ACRONYMS AND ABBREVIATIONS

O&M	Operation and Maintenance
ORP	oxidation reduction potential
POL	petroleum, oil, and lubricants
ppb	parts per billion
PRE	Preliminary Risk Evaluation
PRG	Preliminary Remediation Goal
PVC	polyvinyl chloride
RAB	Restoration Advisory Board
RCRA	Resource Conservation and Recovery Act
RI	remedial investigation
SA	Study Area
SARA	Superfund Amendments and Reauthorization Act of 1986
SI	Site Investigation
SSI	Supplemental Site Investigation
SVE	Soil Vapor Extraction
SVOC	semivolatile organic compound
TOC	total organic carbon
TPHC	total petroleum hydrocarbon
TRC	Technical Review Committee
TSS	total suspended solids
µg/g	micrograms per gram
µg/L	micrograms per liter
USAEC	U.S. Army Environmental Center
USATHAMA	U.S. army Toxic and Hazardous Materials Agency
USEPA	U.S. Environmental Protection Agency
UST	underground storage tank
VOC	volatile organic compound
WWTF	wastewater treatment facility